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THE ETIOLOGY AND TREATMENT OF MYCOSIS OCCURRING IN THE UPPER RESPIRATORY TRACT*.

(WITH ILLUSTRATIONS.)

PRIZE ESSAY BY JOHN SENDZIAK, M. D.,

WARSAW.

The following are the particular varieties of mycoses met with in the upper respiratory tract:

I. Mycosis leptothricia—causative agent, leptothrix buccalis.
II. Mycosis sarcinica—causative agent, a variety of the sarcina.
III. Actinomycosis—the causative agent being the actinomyces.
IV. Mycosis aspergillosis—caused by various kinds of aspergillus.

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V. Mycosis mucorina—produced by certain varieties of mucor. This, according to some authors (Cixlinski, Hewelka, Sendziak, as well as Schmiegelow), causing the so-called "black-tongue."

VI. Mycosis oidica (soor) caused by the oidium albicans.

I. MYCOSIS LEPTOTHRICIA.

Its synonymous terms are mycosis tonsillaris benigna (B. Fraenkel), pharyngo-mycosis leptothricia (Heryng), algosis (Plycosis), faucium leptothricia (Jacobson), and finally hyperkeratosis lacunaris (Siebenmann).

In the year 1873 B. Fraenkel, a distinguished professor of laryngology in Berlin, was the first to draw attention to the hitherto unknown pathologic process—the formation on the faucial tonsils, as well as on the base of the tongue of white and grey, prominent, strongly adherent tufts, which being removed with difficulty, soon reappeared. Under the microscope, these tufts were shown to consist of epithelium and microorganisms (bacilli and cocci); in the second case observed by the same author (in 1880) the examination showed for the most part leptothrix buccalis. Fraenkel found the bacillus fascultatus present in this case. The course of this disease, to which the author gave the name "mycosis tonsillaris benigna" is without fever and chronic in character.

In the year 1883, Heryng of Warsaw made a minute histologic and bacteriologic examination of six cases. He gave a detailed description of this disorder, which, because of the constant existence in the tufts of leptothrix buccalis, he called pharyngo-mycosis leptothricia. These tufts are mostly composed of horny flat epithelium, surrounded by small, white, granular masses and threads of the leptothrix. These latter color blue with iodin.

Since that time great attention has been drawn to this pathologic process, and articles began to appear in all the countries of Europe as well as in America, where the greatest interest was manifested in this disease, one-third of all the papers published appearing in America. French, German, and English literature is replete with papers on the subject, but in Denmark, Sweden and Norway there has been very little written, which can be explained only by the lack of suitable material in these countries.

Besides the articles mentioned by Fraenkel and Heryng, Siebenmann of Basle (Switzerland), published the results of a

minute histologic and bacteriologic investigation, from which he arrived at a different conclusion than that of either Fraenkel or Heryng. He held that the essence of this process consisted in a cornification of the lacunar epithelium:—hence his definition of the process—"hyperkeratosis lacunaris."

The etiology of mycosis leptothricia has not been positively decided. There exists two principal theories:

(*a*) The parasitic, and

(*b*) The chemical theory.

The parasitic theory has the greatest number of adherents. According to this theory the ordinary inhabitant of the oral cavity—the leptothrix buccalis—is the causative agent of this pathologic process. As already mentioned, both Fraenkel and Heryng found this organism in this disorder. Alone, or in great preponderance over other organisms present, this agent was found by the following: Semon, Wingrave, Kinny, Gray, Santabo, Provost, Ruault, Nabias, Sabrazés, Ferré, Krakenberger, Chiari, Jacobson and others.

Some authorities (Hemenway, Rauge), while not denying the parasitic origin of mycosis leptothricia, do not regard the leptothrix buccalis as the causative agent. They hold that other micro-organisms found normally in the oral cavity can produce this type of mycosis also (Parser, Tidswell). In justification of their opinion they cite the fact that leptothrix buccalis is often found on the gums in the neighborhood of carious teeth, a condition in which we do not usually meet with mycosis leptothricia (Hemenway). Chiari, basing his opinion on the observation that there exists only an increase in the number of leptothrix buccalis present, does not regard mycosis leptothricia as an independent pathologic process.

It was Kyle, an American, who, basing his opinion on very minute bacteriologic investigations (in the year 1891), became convinced that in this disorder the micro-organisms act a secondary part, their action principally consisting in causing a chemical reaction in the tissues and secretions. The non-parasitic origin of this disease was also held by Higguet and previous to him by Toeplitz. The claim for priority of the chemical theory, however, belongs to Prof. Siebenmann, who in the year 1895 observed and made a histologic and bacteriologic study of six cases, and who gave out the basis of the chemical theory, endeavoring to limit the role of the leptothrix buccalis in the disorder to that of a simple "saprophyte."

As the principal feature of this disorder, he regards the exceeding strongly marked cornification of the lacunar epithelium. He noted under the microscope the existence of corneous epithelium without nuclei, which protruded in shape like a corneous thorn. These thorns have a central excavation filled with detritus, mucus, and micro-organisms. The parts of such thorns which protrude from the crypts of the tonsils are covered on their external surface with a network of leptothrix.

Referring to the above-described process, this author proposes to change the hitherto used term, mycosis leptothricia, for another more suitable, viz.: hyperkeratosis lacunaris, regarding the latter as an analogous pathologic process to that known as pachyderma of the larynx, leucoplakia of the oral cavity and to a certain extent comparing it to the so-called "black tongue." In regard to the last-named disease, however, opinions are also divided, as we shall see later.

Siebenmann's theory did not find many adherents; but Kraus (Vienna), Lincoln, Friedland, Richardson (America) and Hall (London) are among those who believe with him.

Kyle maintains that we must distinguish two pathologic forms: one which we regard as mycosis leptothricia being simply keratosis, in which condition he disagrees with Siebenmann as to the localization of the pathological process in the crypts of the tonsils, and consequently in his opinion the definition "hyperkeratosis lacunaris" is inapplicable; and, secondly, a form of typical mycosis leptothricia, i. e., a disease depending on the presence of leptothrix buccalis. Kyle also holds that there exists cases of mycosis leptothricia without the participation of the leptothrix buccalis. However that may be, in many typical cases of keratosis we do meet with this micro-organism.

The greatest number of authorities, and among these I number myself, are of the opinion that we are dealing with a typical mycosis caused by the leptothrix buccalis. (Figs. 1 and 2.)

In reference to the term leptothrix buccalis which was introduced into medical science for the first time by Robin, according to Miller, the author of an excellent monograph on the micro-organisms of the oral cavity, we must understand the constant inhabitant of the buccal cavity to be leptothrix innominata, bacillus maximus buccalis, spirillum sputigenum and spirochete dentium. Of these the most important is the

bacillus maximus buccalis, which Kraus claims is identical with the leptothrix buccalis of Robin.

This organism presents itself in the shape of bundles composed of parallel threads, 1 to 1.3 micra in width, which color, in a solution of iodin dissolved in potassium iodid, a blue-violet. In the soft white sediment on the teeth, one finds leptothrix innominata as well as leptothrix maxima buccalis, and a similar organism, the bacillus maximus buccalis, which colors yellow in iodin. The iodococcus vaginatus appears usually in small chains composed of 4-8 cells sticking on the integument, and colors as follows: the cells become bluish violet, the capsules slightly yellow. There has been no success in obtaining

Fig. 1.

Micro-organisms of the oral cavity (leptothrix buccalis, etc.).

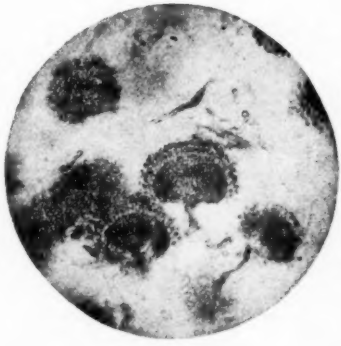

Fig. 2.

Aspergillus fumigatus.

pure cultures of leptothrix buccalis, although Jacobson maintains that in ¾ of his cases he seemed to obtain the culture from the tufts situated in the crypts of the tonsils.

Great development of this inhabitant of the oral cavity seems to favor fermentation in the mouth, as well as to cause acidity of the saliva (Fraenkel); it predisposes to caries of the teeth (Kyle); and may aid in predisposing to gastric trouble (Donnellan, Richardson).

Mycosis leptothricia of the upper respiratory tract is by no means as rare a disease as was formerly supposed, but is rather of frequent occurrence. The literature to date places some

hundred cases on record, which for the period of time—a little more than thirty years, i. e., from the first description of this disorder—is proof enough of its comparative frequency.

I observed mycosis leptothricia 42 times in about 20,000 patients: that is, once in every 500 patients. Krakenberger met with the disease much more frequently, namely, 11 times in 579 patients; on the other hand, Prof. Jurasz (Heidelberg) observed it only 3 times among 4,000 patients. What is the cause of this difference in the statistics? I am of the opinion that the reason for this lies in the fact that Jurasz's material came from the policlinic, i. e., from among the poor who were undoubtedly less liable to become afflicted with mycosis leptothricia. My material is composed of ambulatory (16 cases) as well as private practice (26 cases from among the general number of 10,000 patients), while Krakenberger's cases are mostly from his private practice.

Mycosis leptothricia is relatively more frequent in females than in males—24 to 18 was the ratio in my cases. Other authorities (Krauss, Rosenberg, Phillips) have made similar observations. Heryng had 8 cases in females and 6 cases in males.

The ages of my patients who were afflicted with this disorder were as follows:

between 10 and 15 years there were 5 cases,
between 15 and 20 years there were 11 cases,
between 20 and 30 years there were 13 cases,
between 30 and 40 years there were 10 cases,
between 40 and 50 years there were 2 cases,
between 50 and 60 years there was 1 case.

The above figures show that mycosis leptothricia occurs in the respiratory tract mostly in adults, especially between the ages of 15 and 40 years. 34 cases, almost 4/5 of all, occurred in these ages; before 10, and after 40-50 years of age its occurrence is very rare.

There are only two cases on record below the age of 2 years —the age of Dubler's patient was 8 months.

In reference to the influence of occupation, my cases present the following:

Of 24 females, 15 were unmarried, 7 married and 2 were widows; of the 15 unmarried, 9 were pupils and 1 was a governess; of 18 males there were 4 schoolboys and 2 students, besides 4 landed proprietors, 1 engineer, 1 cashier, 1 civil of-

ficer, 1 pensioner, 1 joiner, 1 watchmaker, 1 cook and 1 tailor.

The frequent occurrence of mycosis leptothricia in the "school age" of both sexes, markedly so in girls, is striking. That they are predisposed to it at this time is likely, although unhygienic conditions as well as overburdening them with work is also of importance. It is more difficult to understand the frequent occurrence of this disorder among landed proprietors who live under conditions that seem least predisposing to the development of this mycosis. In my cases, I have noted the frequent occurrence of mycosis leptothricia in the better classes, i. e., in private practice.

W. C. Phillips made the peculiar observation that this disease occurs especially in young women very fond of pets, such as dogs, cats and horses, and H. H. Curtis observed that almost every one of his patients had been accustomed to eat raw apples which very often had been licked by such animal pets.

In Myles' cases keratoid spots developed suddenly during an exclusive milk diet.

Undoubtedly one must reckon among the predisposing causes of this disorder bad health (Semon), although, as I have mentioned before, healthy people are not free from this mycosis.

In five of my cases—young girls—there were distinct symptoms of anemia, and in one case, the patient had a typical chlorosis.

Rosenberg observed the disease in a pregnant woman.

Further, I noted in one of my cases—a female 33 years of age—symptoms of tubercular affection of the lungs. Richardson's observations show the presence of more or less pronounced gastro-intestinal disturbances.

The predisposing causes of this disorder may be summed up in saying that a diathesis to this disease has been noted (Root), that any catarrhal affection of the upper respiratory tract, and the acute infectious disease, play some predisposing role—Glasgow having noted the disease as following influenza—but the abuse of alcohol and tobacco do not play an important part as a predisposing agent. I only noted the abuse of tobacco in two of my cases.

The localization of mycosis leptothricia in the upper respiratory tract: According to Siebenmann's theory, i. e., of keratosis, the oral portions of the pharynx, especially the faucial tonsils and their crypts, are the seat of the lesion. Hemenway

even proposes the term mycosis tonsillaris. I do not support this proposition. There can be no doubt that mycosis leptothricia can embrace any part or all of the upper respiratory tract extending from the nasopharyngeal cavity (Garel, Labit), affecting for the most part Luschka's tonsil, extending even to the ostia pharyngea tubarum (M. Schmidt), and finally involving the fossa Rosenmuelleri (Law) and ending at the larynx,—or at the laryngeal surface of the epiglottis (M. Schmidt, Grant). The disease has been observed at the aryepiglottic ligament (Dubler); Root has seen it at the sinus pyriformis; the vocal cords have also been affected (Price-Brown), and even that portion of the larynx below the cords has been the seat of the disorder (Cobb, Dubler).

All these cases speak against Siebenmann's theory. On the other hand, it is unquestionably true that the most frequent seat of mycosis leptothricia is the faucial tonsil. In my cases these were affected 15 times, the left one 8 times and the right 5 times; in the remaining two cases both tonsils were equally affected; the left tonsil alone was affected 3 times, the right alone only once. In a relatively larger number of cases the tonsils and the base of the tongue, i. e., the lingual tonsil, were the seat of mycosis leptothricia—this occurred 13 times. Both Fraenkel and Kraus believe this region the most frequent seat of the disorder. Heryng saw the affection of the tonsils, alone, 7 times and 7 times he observed the disease also involving the base of the tongue. A rather rare case of this mycosis, in which it was situated on the body of the tongue, was observed by Tuttle.

The disease is principally situated in the crypts of the tonsils; exceptionally, however—as seen in one of my cases—the principal seat of the lesion is the lingual tonsil at the base of tongue. I saw the lesion on the lingual tonsil alone in 3 cases. Rarely both faucial tonsil and pharyngeal tonsil are affected simultaneously—this occured in only one of my cases. I saw the whole pharyngeal ring involved only once; in two cases, the faucial tonsils, the pharyngeal walls, which were covered with granulations, and the lateral folds behind the posterior arches were affected. Once the faucial tonsils, the base of the tongue, the lingual tonsil and the pharynx were the seat of the lesion, and, finally, in one case the faucial and lingual tonsils as well as the laryngeal surface of the epiglottis were affected.

Summing up, there can exist the most varied combinations as to the location of the lesion. The rare case observed by Curtis, wherein the extension of the mycosis went through the nasal ducts to the eye, besides involving the pharynx and larynx, is a case in point. Once I observed laryngeal involvement alone—typical tufts on the vocal cords—and Grey saw the region of the arytenoid cartilage involved, the corresponding vocal cord being immobile. In Price-Brown's case the affection coated the ventricular bands and in Cobb's case the vocal cords and the lower part of the larynx were the seats of the lesion.

Clinical Picture.—Mycosis leptothricia in the upper respiratory tract shows itself in the form of more or less numerous pearly white, hard tufts or spots which are situated in the crypts of the faucial tonsil, the lingual tonsil, and sometimes seen in the follicles of the posterior pharyngeal wall. These tufts are characterized above all by a corneous consistency, having the appearance of thorns, or, as described by Schmidt, of stalactites; or by Toeplitz as condylomata. They are further characterized by their exceedingly strong adherence to the adjacent tissues, their removal being attended with great difficulty, and followed by abundant hemorrhage. The tissues surrounding them may be entirely normal or in a state of catarrhal inflammation. It is a debatable question whether this latter condition has or has not a causal relationship with leptothrix buccalis (M. Schmidt).

These tufts, as a rule, form slowly, without inflammatory symptoms, although exceptionally they do occur in more acute forms (mycosis leptothricia acuta, or angina leptothricia). Of the last named disorder, cases were described by Santabo and Dubler (a case of a child eight months of age followed by death), Ruault, Spaans and Unterholzner (each observed 3 cases). Personally I saw four cases of leptothricia acuta.

The Course of the Disease.—The course of the disease is generally slow. It may last weeks, months and even years. Generally during the later periods the tufts begin to show ramifications. Their removal is then easier (Parker). The process may cease spontaneously. Ordinarily, however, mycosis leptothricia is characterized by great resistance to treatment and relapses are frequent, even after the most energetic attempts at complete removal of the organisms.

Symptoms.—Mycosis leptothricia may occur in the upper respiratory tract without giving any symptoms of its presence. Patients come for consultation, anxious because of "white spots" on their tonsils, or the physician only accidentally discovered the spots when looking for some other disease (Michelson, Root). I, personally, had occasion to see such cases. Occasionally this disorder gives rise to a train of symptoms, as, for instance, scratching and pricking, burning, stiffness, fullness in the throat, disagreeable taste (Root), and pain in the throat (Ingals). In most of my cases there existed a sensation of a foreign body (the so-called paresthesia pharyngis); twice I observed fetor ex ore, and in 3 cases of Ingals, there were symptoms of dyspepsia; this was also the disturbing symptom in Richardson's cases.

Naturally in the acute forms of mycosis leptothricia there may exist dysphagia, fever and enlarged lymphatic glands of the neck (Spaan, Unterholzner).

Diagnosis.—The diagnosis of mycosis leptothricia generally does not present any difficulties, thanks to its highly characteristic symptoms, namely, the appearance and consistence of these corneous tufts situated in the crypts of the tonsils, so that even without the microscope the diagnosis is possible (Kraus). In all my cases I was able to make this diagnosis a priori, after which I proved its correctness by the microscope. As to the differential diagnosis, the condition most similar to mycosis leptothricia is "tonsillaris caseosa" and this differs from it in the consistency of the tufts; here they are soft and easily removed, and are localized to the tonsillar crypts, while mycosis leptothricia may occur, as already shown, in any part of the upper respiratory tract—except the nasal cavities.

The microscope should solve all doubt as to mycosis leptothricia, the tufts being composed entirely of the characteristic threads.

For a rapid examination, Seifert and Kahn advise that the masses be rubbed on an objective glass, acidified with a few drops of lactic acid, and then colored with ½ drop of a solution of iodin in potassium iodid. The large bundles and heads of the leptothrix buccalis will show themselves colored blue. (Fig. 3.)

In cases of caseous tonsillitis, we meet with various organisms from the oral cavity, among which, however, there may also be the leptothrix buccalis, but then this organism is pres-

ent in small numbers. Besides, as caseous tonsillitis is the result of a desquamative inflammatory process, the tufts will be composed of corneous epithelium, mucus, leucocytes, and particles of food, etc. In my opinion, a certain number of caseous tonsillitis cases, if examined minutely under the microscope, will turn out to be cases of real mycosis leptothricia. This took place in one of my cases. A woman of 33 years came to me with soft tufts in the crypts of both tonsils—the diagnosis of tonsillaris caseosa was made, but under the microscope leptothrix buccalis was found to be the true condition present.

Of the acute inflammatory processes, the condition most simulating mycosis leptothricia is the angina tonsillaris follicularis, wherein, however, the high fever as well as the swelling of the lymphatic glands of the neck is distinctive. Less similar is diphtheria; here we do not have to deal with tufts and spots, but with a membrane. At any rate, diphtheria sometimes simulates this disorder, and a proper diagnosis can be made only through the use of the microscope.

Prognosis.—The prognosis of mycosis leptothricia of the upper respiratory tract is in general a favorable one; spontaneous recovery is possible (Semon). It took place in one of my cases. Relatively the prognosis is not so favorable. Mycosis leptothricia is a very obstinate disease and relapses are common. In literature there is recorded only one death—Dubler's cases, a child of 8 months.

Treatment.—Some authorities, among whom are Semon, Schmidt, Richardson and Kraus, are of the opinion that in cases without subjective symptoms local treatment is superfluous, the more so as spontaneous recovery is a possibility. Where the general health is bad, treatment should be applied to remedy this—tonics, change of air, sea voyages, etc. (Semon, Wilson). In cases where such exist, correction of disturbances of the gastro-intestinal tract are indicated (Richardson). The greater number of authorities, and to their opinion I adhere, believe that local treatment should be undertaken, and that it should be of a most energetic nature in order to avoid relapses.

Besides gargles of bichlorid, 1 to 2000 and as strong as 1 to 1000 (Chiari), 1 to 500 (Parser) and even as strong as ½ to 2 per cent (Puterman), 5 per cent zinc chlorid has been used by Nabais and Sabrasés; silver nitrate 1 to 25 per cent has been used by Powers and Tuttle; acido salicylic, 1 to 4 in alco-

hol, has been employed by Tilly; absolute alcohol is the recommendation of B. Fraenkel and Baber; pyoktanin, 10 per cent, is recommended by Curtis and Lincoln; formalin, 10 per cent solution, has been employed by Lederman; tincture of iodin by Grant; nicotin in a proportion of 0.2 to 100 by Jurasz. (In one of my cases I had good results from the use of this drug.) Chromic acid is recommended by Griffin, Prevost and Wagner, and finally trichloracetic acid alone, or after the application of the galvanocautery is recommended, a procedure which netted me the best results. Stern and Arnsperger recommend a radical method of treatment, namely, that of curetting the tufts with a sharp spoon; Root follows this with the galvanocautery. The best method is to puncture the crypts with a sharp cautery. This last named method has many adherents, among whom we count Heryng, Deckert, Seifert, Hemenway, Thomas, Cheatham, Hamilton, Kenny, Wartham, Price-Brown, Hall, Phillips and myself.

Pooley recommends free slitting up of the canaliculi and curetting them in cases where the leptothrix is situated in the canaliculi of the tonsils.

The adversaries of the galvanocautery include Spicer, Ottuszewsky, and especially Semon, the latter of whom, after having cauterized mycosis, situated on the base of the tongue, observed parotitis take place with high fever (40° C.). In one of my cases I had disagreeable complications after the use of the cautery on the lingual tonsil, high fever and great prostration; this occurred in a woman 25 years of age.

It must be understood that wherever there exists a distinctly expressed hypertrophy of the tonsil, this should be extirpated, and this is best done by means of the galvanocautery snare, in order to avoid secondary bleeding.

Finally, I must note the favorable influence of tobacco smoking upon the course of mycosis leptothricia, which was observed by Jurasz, Donellan, M. Schmidt, Collin, and finally by me in a patient 30 years of age, who, after having commenced to smoke, remarked, after a little while, that all the tufts on his tonsils disappeared entirely, without any other treatment. Of this observation I am sure. We must not forget, however, that tobacco is a two-edged remedy and as such ought not to be recommended (M. Schmidt).

II. MYCOSIS SARCINICA.

This disease occurs in the upper respiratory tract on the mucous membrane of the oral cavity in persons who suffer from disease of the lungs, pneumonia, bronchiectasia, gangrene, and especially in persons suffering from tuberculosis or typhoid. It occurs in patients having any catarrhal trouble of the mucous membrane of the oral cavity—stomatitis; it is present in marasmic patients, and it may occur in healthy persons.

From the oral cavity and the pharynx, the mycosis may extend to the lungs, as well as to the stomach, where the parasite—sarcina ventriculi—was discovered for the first time by Goodsire (1842) in stomach contents.

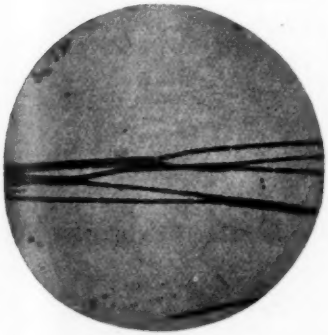

Fig. 4.

Leptothrix buccalis (Gentian violet).

Fig. 5.

Sarcina (yellow-green) from air.

Sarcina enters the upper respiratory tract from the air, where it is present in various forms. In the lungs we find the colorless form, while in the oral cavity its most frequent form is the yellow-green type. (See Fig. 5.)

This parasite is found on the mucous membrane of the tongue, as well as on the soft palate (Fischer, Friedreich) in whitish diffuse masses similar to mould (soor). Under the microscope they present themselves as colorless or yellow-brown, round or small oval cells 2.5 micra in diameter, which are chained one to the other (8 examples). They form small hexagonal figures, rounded at the angles and sometimes arranged in large patches.

Recent investigation has shown that we are not dealing with a distinct type of sarcina in any one condition, but that all or any kind may occur in the body which are found in the external air. Mycosis sarcinica has no particular importance. General symptoms are lacking. On the whole, little has been written on this question, and we must refer those interested to Fischer's paper.

III. ACTINOMYCOSIS.

The parasite is the actinomyces. The cause of this pathologic process was discovered in the year 1845 by Langenbeck, and in the year 1877 Bollinger discovered it in horned cattle, among which the disease is most common. To Prof. Israel, however, belongs the honor of having first definitely described this parasite as a substantial pathologic process in man.

Some authorities (Niessen, Hesse) maintain that actinomycosis depends on other parasites, among which is the cladothrix liquefaciens (Hesse), yet Wolff and Israel, as well as Ponfick and Bostrom, the most authoritive investigators of this disease, do not agree with this opinion.

The subject of actinomycosis of the upper respiratory tract is covered by many papers, the greater number of which were published in Austria, Germany, France and Sweden.

The parasite is usually transferred indirectly to man, exceptionally it is transplanted directly from cattle. Bardez observed a case wherein infection took place from the mouth of a man to the mucous membrane of a child by means of a kiss. This author believes that flies are also a source of possible infection.

Actinomycosis is primarily located in the oral cavity, on the alveolar process of the lower jaw (Mikulicz), causing periostitis alveolaris. It rarely spreads through carious teeth to cause actinomycosis of the lower jaw itself. Rarely a primary pyorrhea alveolaris is present. When we see the patient there is usually the growth or abscess on the lower jaw, and sometimes fistulæ, from which a slight amount of secretion exudes.

On the summit of the tongue the growth is very hard and strongly circumscribed. That it is sometimes localized there, is evidenced by the cases of Flackner, Bargez, Fischer, Mayer, Hochenegg, Albert, and finally by Bonnet, who, in his dissertation in the year 1896, cited 5 cases of this kind, finding the mucous membrane of the cheek also affected in the neighborhood of the ductus stenonianus (Partsch).

The growth on the tongue, in size equal to that of a pea, shows a slight predisposition to destruction.

From the oral cavity, actinomycosis may extend to the pharynx, producing great swelling in the palatopharyngeal region, with white-yellow nodules identical in appearance to follicular abscess. Retropharyngeal abscess, caused by the actinomycosis was observed by Schlinge. It seems to avoid affecting the faucial tonsils. Butlin, the author of the best monograph on diseases of the tongue, fails to mention any case of actinomycosis of the tonsils. More recently, however, Cheatle, Emory, Wright, Thevenat, Ruge, Mikulicz, Didsbury and Bonnet would seem to deny this observation in which Israel originally concurred.

Further, actinomycoses may spread to the larynx, affecting the arytenoid cartilages and the cords, and extending to the posterior mediastinum (Mündler). The involvement of the larynx may also take place by extension of the pathologic process from the external portion of the neck to the thyroid cartilage (cases of Henrici, Kochier, Bérard, Lubliner and Mündler). I observed such a case in a patient 53 years of age.

Primary actinomycosis of the esophagus was seen by Garde (6 cases); its appearance in the esophagus, as a secondary process, was reported by Abbé.

In general, actinomycosis of the upper respiratory tract does belong to the rare diseases. There are published in literature some 200 cases in point. In some countries it seems to be almost epidemic, namely, in Austria and Germany, where about one-half of all cases recorded occurred.

The disease is twice as frequent in men as in women, which is explained by their occupation bringing them oftener in contact with cattle than does the occupation of women. It affects those between 10 and 40 years of age; below 10 and above 40 the disease is very rare. I had one case—a landed proprietor—who was 53 years of age.

The course of actinomycosis in general is chronic—rarely sub-acute—and exceptionally acute with purulent symptoms (Roosa, Kapper). On account of secondary infection with purulent micro-organisms, lymphatic involvement may be produced (Cheatle, Emory).

The symptoms of actinomycosis of the upper respiratory tract consist, in general, of very violent pains in the region of

the pathologic process—in carious teeth; in neuralgic pains on the corresponding side of the face, although some authorities (Wright) give, as characteristic, the complete absence of pain. In acute cases there are present fever, chills and attacks of suffocation and pain during the act of swallowing (Kapper).

The diagnosis of actinomycosis should not be difficult, except in the beginning forms, where the condition presents nodular infiltrations, and then the disease is apt to be mistaken for malignant neoplasms (carcinoma). The chronic course, the greatly indurated surrounding parts, the slight excretion exuding from the fistulous opening, the localization of the trouble to

Fig. 6.

Actinomyces bovis (cuts of the growth on the tongue) Gram-Günter.

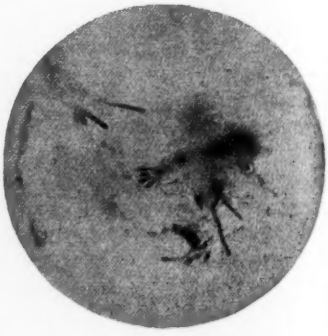

Fig. 7.

Actinomyces bovis (growth on the lower jaw) Gram's method.

the face and neck (Illich) and finally the noninvolvement of the lymphatic glands—all these points help in a certain degree to make the diagnosis. When the abscess is already formed, then the diagnosis is easy, because of the characteristics visible to the naked eye, the pus examined containing suspended in it the yellow grains, which under the microscope, after coloring with potassium, show the radiant structures with mace-like ends of the actinomyces. They also color well by Gram's methods, or better still its modification, i. e., with the addition of carmine (Gram-Günter) the threads coloring bluish-black, the butts red. (See Figs. 6 and 7.)

Relative to the differential diagnosis, we must take under consideration the following pathologic processes: Gummata, which are undergoing destruction, carcinoma of the esophagus, tubercular growths especially, chronic abscess of the tongue, suppurating cysts and, finally, cysts. In all of these processes, however, the clinical picture, the history and examination of the lymphatic glands of the neck, and the microscopic examination which will give the characteristic yellow grains in the pus, will clear up the question of differential diagnosis absolutely.

Generally speaking, the prognosis of actinomycosis is not favorable, and this is especially true where the internal organs have become affected by metastatic processes, which may occur either in the brain, pleura, kidneys, liver, heart, lungs, etc. (Hesse). The prognosis is worse in cases of the lower jaw, larynx and esophagus, where there is inclination for its extention to the mediastinum. In cases of actinomycosis of the base of the tongue, where the process is circumscribed and, therefore, operable, the prognosis is more favorable. I may note in passing, that in one of my cases of actinomycosis of the larynx, paralysis of the recurrent nerves of the corresponding side followed.

The treatment of actinomycosis occurring in the upper respiratory tract is primarily surgical in nature. Careful curetting or excision of the pathologically changed tissue is called for. Some authorities recommend the application of a 5% solution of carbolic acid, and 1 to 1000 bichloride (Korff); the application of ½ to 1% methylviolet is recommended by Raffa, and nitrate of silver fused on a sound and introduced into the fistulous opening is used by Kœttaitz. Finally, there are many adherents to the administration of potassium iodid internally, by which they seem to obtain recovery without operation. Among those who employ this method of treatment we count Lissa, Claisse, Bérard and Heryng.

Besides the already described mycosis occurring in the upper respiratory tract, i. e., mycosis leptothricia, mycosis sarcinica, and the actinomycosis, we meet with various kinds of moulds.

The principal ones of these are classed under the hyphomycetes, aspergillus, mucor, and the oidium, and finally the rarer form—the penicillium. In the botanical sense these differ only from each other by the method in which they form their

spores; as, for example, the mucor, where the fruit-carrying threads arise from the entangled mycelium bearing a little bag (the sporangium) in which are the spores (conidia). In the aspergillus, however, the fruit-carrying thread is thickened in the form of a mace to whose surface small "sterigmata" adhere, carrying the spores (Fig. 2). In the oidium variety the spores adhere directly to the fruit-carrying thread (Figs. 9 and 11). Finally, in the penicillium the fruit-carrying thread has ramifications very similar to small pencils on which the spores are formed. (Fig. 8.)

Among the various kinds of aspergillus and mucor observed in the respiratory tract, there have been found aspergillus fumi-

Fig. 8.

Penicillium glaucum.

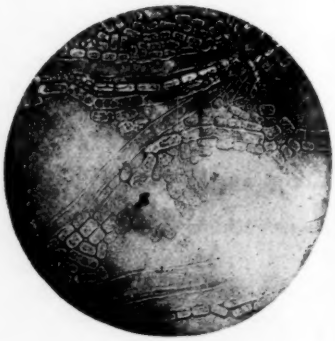

Fig. 9.

Oidium albicans.

gatus, glaucus and nigrescens, as well as mucor corymbifer and niger, the latter of which is the cause of the "black tongue" (Cixlinski, Hewelke); finally, penicillium glaucum is also found. The most important of all the pathologic mould parasites is the oidium albicans, the o. lactis (Robin)—the cause of "soor"—French, muguet—English, thrush. To this class certain varieties of yeasts also belong (blastosaccharomyces), as was demonstrated by the more recent investigations of Busse, Robinowicz, and especially by San Felice. (Fig. 10.)

The best method of examining these moulds under the microscope is as follows: A small quantity of the material is put

in a drop of glycerine on an object glass and divided into very small particles by means of needles. It is then covered and examined with a strong dry lens. Coloring of the specimen is unnecessary, unless examined in tissues, when the method recommended by Weigert should be followed out.

The above-named moulds develop best at a body temperature. They grow best on sterilized bread cultures. Recent observations have shown that aspergillus and oidium are not substantial forms. The aspergillus is only a form of fruit-carrying variety of the Eurotium, while oidium is the conidial form of Erisyphe. The last named, as well as the Eurotium, belong to the Ascomycetes.

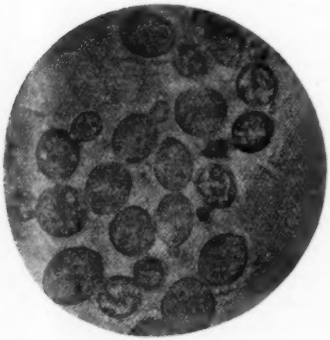

Fig. 10.

Yeasts (dregs) of beer.

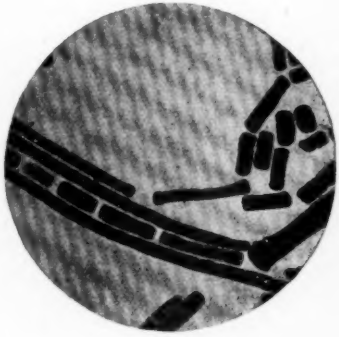

Fig. 11.

Oidium albicans (fuchsin).

IV. MYCOSIS ASPERGILLINA.

This variety of mycosis in the upper respiratory tract is rarely seen. The cause of this undoubtedly is due to the peculiarity of these organs. For example, in the nasal cavity the obstacle to the development of this parasite is the constant current of air passing through the nares (Deile), as well as the constant bathing of the nasal mucous membrane in its natural secretions; further, the existence of purulent microorganisms (cocci) are inimical to the development of these parasites, and finally, the temperature of the body is not a suitable one for their development. In the pharynx, however, a

poor development of the aspergillus takes place on the mucous membrane covered with mucus; it also occurs on ulcerated surfaces where the secretions are fetid (Siebenmann).

Persons working in tanneries, or those dealing in leather, are predisposed to this disease, as leather is an excellent medium in which the development of the aspergillus occurs. In general, this parasite occurs as a saprophyte, and is a habitant of living mucous membrane.

In the upper respiratory tract we meet with three varieties of aspergillus—fumigatus (the most frequent type), glaucus, and nigrescens.

There are only 8 publications on record, from which I quote lus fumigatus in both nasal cavities in a case of ozena.

1. The case of Dunn of Richmond, who two weeks after the cauterization of the nasal septum with chloroform, found a scab covered with brown-yellowish substance looking like fruit-jam, which under the microscope proved to be aspergillus glaucus.

2. Case of Delic of Leipsic, who found on autopsy aspergillus fumigatus in both nasal cavities in a case of ozena.

3. The case of Mackenzie of Baltimore, where in a patient suffering with empyema of the antrum of Highmore, the patient expelled some of the membrane of the sinus, on which there was found (under the microscope) aspergillus fumigatus.

4. Zarniko's case: This was an analogous case to the above—a woman 50 years of age with empyema of the antrum of Highmore—the findings were aspergillus fumigatus.

5. Schubert's case: A badly nourished woman 75 years of age, whose nasopharyngeal cavity was filled with a dark brown-green mass appearing clay-gray externally, with symptoms of total nasal obstruction, and who expelled a cast from the nose and nasopharynx, which, under the microscope, showed the external layer to be composed of degenerated mucous corpuscles and flat epithelium, while centrally the mass gave evidence of the presence of aspergillus fumigatus.

6. Siebenmann's case, wherein the fold of the pharynx of an old woman was covered with scabs, which were composed mostly of aspergillus fumigatus and a. sidulans, as well as mucor corymbifer.

7. Dick's case: A young healthy man, who showed between the arches of the faucial tonsils tufts of corneous substance of a blackish color, which, under the microscope, proved to be aspergillus nigrescens.

I must note in passing that Guarnacia of Catania (Sicily) observed 3 cases of otomycosis aspergillus (cause—aspergillus niger), which were cured by the use of hydrogen peroxid (with 20 % oxygen).

M. Schmidt observed aspergillus fumigatus, as well as glaucus, in the nose of a case with atrophic rhinitis.

V. MYCOSIS MUCORINA.

Mycosis mucorina in the upper respiratory tract occurs rarely. It appears in two forms:

1. Mycosis dependent on the mucor corymbifer.
2. Mycosis depending on the mucor niger—the more usual form.

The first form was observed by Paltauf of Vienna. A patient, 52 years of age, was suffering from enteritis and peritonsillitis circumscripta, with fever, cough and swelling of the spleen; the patient had icterus, as well as affections of the sensorium. After 14 days death took place, and the autopsy showed, among other things, phlegmon of the pharynx and larynx which, microscopically, was found caused by mucor corymbifer. The case of Siebenmann, mentioned above, also belongs in this category.

The second form—mycosis mucorina nigra—occurs oftener, according to Cixlinski, Hewelke, Sendziak and Schmiegelow. It forms the essence of the so-called "black tongue." We understand by this term the pathologic process characterized by the appearance on the superior surface of the tongue in the neighborhood of its base, in front of the papillæ circumvallatæ, of more or less extended discoloration—generally black, sometimes brown (Sendziak), or even yellow (Dinkler)—of an irregular oval form, or triangular, with an even, or more frequently, an uneven hairy surface. The process may be acute, lasting two days, or it may be chronic, lasting months and even years.

The disease is not as rare as it was formerly supposed, and we meet with it recently quite frequently in literature. There are about 50 articles on the subject, the greater part of which are English; then come the French and the German. Personally, I have seen 4 typical cases of "black tongue."

The English writers on this subject include Stocker, Broatch, Brydon, Barnes, Balfour, Graham, Masters, Smith, Lediard, Lake, Potter, Abercrombie and Semon; in America, Leviseur, Lohéac, Maraval, Goodale and Johnson have written; in France,

Villar, Surmont, Wollerand, Lannois, Robert, Lecocq and Weil; in Germany, Schech, Bernhardt, Brosin, Dinkler; in Austria, Roth; in Poland, Rydygier, Cixlinski, Hewelke and Sendziak; in Belgium, Massoine and Parmentier; in Holland, Sell; in Denmark, Schmiegelow, and, in Russia, Gundobin.

What is the essence of the "black tongue?" Its etiology is not quite clear. We only know that it occurs more often in men than in women. (All of my 4 cases were males.) It seems to occur at a more advanced period of life—between 40 and 70, although it may occur in children. Gundobin's case was a child 1½ years old. Of my patients, the youngest was 30 years of age.

Some authorities (Cixlinski, Hewelke, Sendziak, Roth, Robert, Vollmer, Maraval and Parmetier) believe this disorder due to the abuse of tobacco, which I noted in all of my 4 cases. Others (Gundobin and Lohéac) hold that it comes from disturbances of digestion and acidity in the mouth. In one of my cases, a patient 30 years of age, the whole body, but especially the breast and shoulders, were covered with abundant hairs. In another of my cases, gastric disturbances were noted. In Lediard's case, there was present simultaneously with it cancer of the tongue; in Bernhardt's case, tabes dorsalis; Vollmer's case, stomatitis mercurialis; Sendziak's case, myelitis; Masoni's case, tuberculosis; Loheac's case, pregnancy, and again in Sendziak's case, spasms of the esophagus.

Dinkler observed the occurrence of black tongue following scarlatina.

Etiology: Most of the authorities, of whom I name Rosenberg, Bresgen, Schech, Brosin, Surmont, Wollerand, Rydygier, Stocker, Leviseur, Masoni, Potter, Vollmer, Goodale, Wingrave, Augier and Johnson see in the pathologic process a hypertrophy of the epithelium of the filiform papillæ with secondary cornification (hyperkeratosis—Brosin, Schech). The dark color of the tongue seems to depend on the increased corneous pigment in the normal corneous cells, so that the older, harder and dryer the corneous layer is, the darker the discolorations will be.

Although some authorities, among whom are Schech, Rydygier, Wingrave, etc., found on examination various organisms —leptothrix, cocci, bacilli, etc.—they regard these as of accidental occurrence, having nothing to do with the etiologic factor of the pathologic process. On the other hand, in one

of Sendziak's cases, where an autopsy took place, the pathohistologic examination of the tongue showed the characteristic traces of "black tongue," or, more properly, brown tongue. There were no distinct changes or hypertrophy or keratosis of the filiform papillæ. At any rate, the idea of the parasitic origin of "black tongue" was suggested long ago by some authorities. Dessoix and Sell regarded this disease as a mycosis, depending on the so-called glossophytons, the parasite showing itself in the form of small oval globes, strongly refracting the light and giving a dark color to the papillæ. (According to Brosin, who observed the case, they were not fully developed mould parasites, i. e., soor.)

Raymond also held to the parasitic origin of the disease. He found delicate spores, round or oval in form, situated on the filiform papillæ. West is also of this opinion. Dinkler found in the sediment on a black tongue closely entangled threads with sprouting excrescences, which were sharply pointed. Roth in 2 cases found very numerous micro-organisms, which he believes depend for their existence on this pathologic process. Lake found rounded spores in cases of black tongue, which he regarded also as the cause of this disorder. Butlin—the author of the best monograph on diseases of the tongue—also holds the opinion that the trouble is of parasitic origin. With this view Launers agrees, and Gundobin, who saw 3 cases, found various parasites — leptothrix, spirochete buccalis, oidium albicans, bacillus subtilis, staphylococcus albus, etc. Again Lecocq, as well as Loheac found leptothrix and spores similar to trichophyton.

All these observations, however, by no means solve the question of the etiology of "black tongue." None of the above named authorities has proven his opinion. Only Dinkler made cultures, and these were without positive results. Cixlinski and Hewelke, in the year 1892, cultivated the mould parasite in acute cases of "black tongue" observed by them. The chronic condition they regarded as the result of cornification of the hypertrophied epithelial cells of the filiform papillæ. They found mucor niger of a form morphologically identical with mucor corymbifer, but differing from this in the want of pathogenic properties, hence these authorities propose for the acute type of "black tongue" another more scientific name—mycosis linguæ nigra s. nigroties mucorina linguæ.

Two years later, Sendziak of Warsaw observed two cases of

chronic "black tongue." He cultivated mucor niger, hence he believes in the mycotic origin of the disease.

Finally, in 1895, Prof. Schmiegelow also cultivated parasites of variety known as hyphomycetes (mucorinæ) from 2 cases of "black tongue." They differed a little from the parasites described by Cixlinski, Hewelke and Sendziak; Schmiegelow supposes that the negative results of the bacteriologic examination depend on unsuitably chosen culture media. He thinks the best culture media for this parasite to be a composition of white bread and gelatine kept at a temperature of 21 degrees C. At 37 degrees C. this parasite does not grow.

Regarding the etiology of "black tongue," it is somewhat analogous to mycosis leptothrix, which, as already shown, is regarded by some (Siebenmann, etc.) as a hyperkeratosis, but by the greater number, as caused by the leptothrix buccalis. I regard "black tongue" as a mycosis, caused by the mucor niger, which I successfully cultivated in two cases. (Figs. 12 and 13.)

The course of "black tongue" is generally acute (Dinkler, Cixlinski, Hewelke, Gundobin), sometimes it runs a chronic course (Sendziak and Gundobin). In all my cases the course was chronic.

The symptoms differ; a bad taste in the mouth (Sell), sensation of a foreign body, salivation, burning, diminution of the mobility of the tongue are the more common symptoms. Sometimes there is an entire absence of symptoms, as was observed in one of my cases.

The diagnosis of "black tongue," thanks to the clinical picture of hairy black, or brown discoloration on the posterior part of the papillæ circumvallatæ, presents no difficulties.

In the differential diagnosis, we must think first of all of morbus adressoni, in which there was observed by Fowler bluish-black colorations on the tongue, but here the discolorations were also to be seen in other parts of the oral cavity. One must remember that the application of certain drugs, as well as certain foods, drinks and also tobacco may simulate this disease.

The prognosis of "black tongue" is favorable when the process is not complicated by other serious diseases—Sendziak's case of myelitis.

The treatment of "black tongue" consists of scraping away the hairy productions, as well as using alkaline gargles. Brushing with a 5% solution of zinc chlorid, the application of hydro-

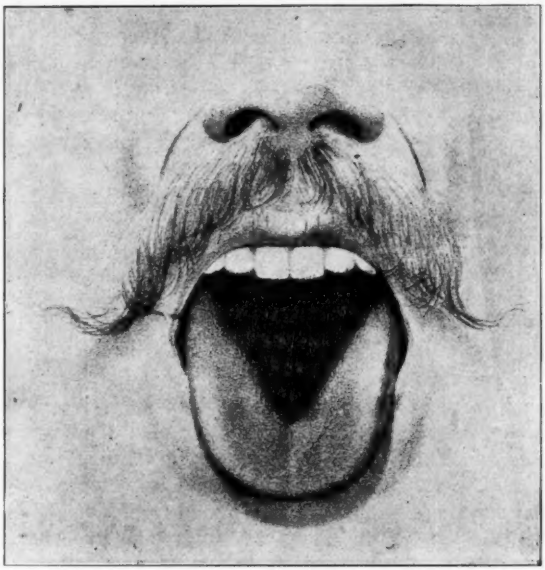

Fig. 12.
(Lingua nigra).

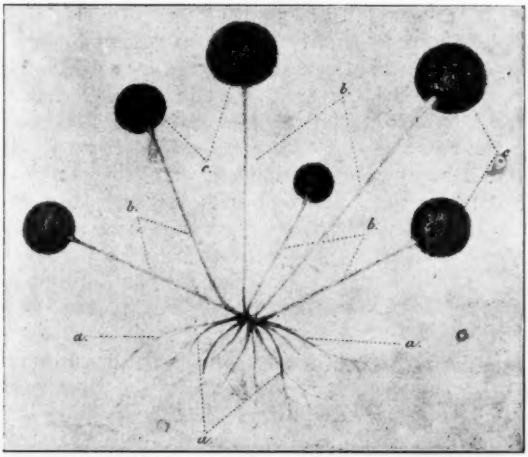

Fig. 13.
(Mucor niger) Hartuack 4, oc. 3. From culture on the bread with gelatine in the above case.
a. mycelium. b. fruit-carrying threads. c. sporangia.

gen peroxid, 10% solution of bichlorid of mercury are all recommended. 5% salicylate acid, and 10 per cent resorcin are also used. Semon and Unna have employed 5% collodium. Abstinence from smoking is also important—(Maraval's case, in which after the commencement of smoking the disorder reappeared.) In cases where all symptoms are absent, all treatment is superfluous.

VI. SOOR.

(French, muguet; English, thrush)—that is mycosis soorina.

Since the days of Hippocrates, soor was not distinguished from aphthæ. At the end of the 18th century this term was first accepted in France as the definition of a distinct pathologic process. This is the disease "par excellence" of childhood; one meets with it mostly in sucklings, especially in the first days and weeks, but it may be found to the end of the second month in artificially nourished children. Uncleanliness of the oral cavity during dentition, the weak constitutions of the children, as well as the nature of their nutrition, favor the development of this pathologic process.

It is rarer in children over two months of age, although in adults it may occur, according to Thorner, Sendziak, Gage, Oppenheim, Teisser, Tordens, Scheff, as well as Reubold, who saw 50 cases below one year, and only 10 times observed it after 20 years of age. I have seen 4 cases in adults (2 females and 2 males) between the ages of 15 and 70. Mettenheimer reports a case of a female between 80 and 90 years of age.

In adults, thrush occurs during long and exhausting diseases, as for instance, tuberculosis—I had one such case—diabetis mellitus, typhus, gastritis alcoholica. I also saw it in a case of heart disease. Thrush may also occur with parotitis (Damashino). Finally, thrush has been observed in quite healthy men by Schmidt, Schech, Frænkel, Mlinik, Freudenberg and Seifert.

As a result of acute pathologic processes, thrush occurs less frequently in adults (Forcheimer); Löri described a case of croupous pneumonia, in which, on the 7th day of the disease, during the crisis, thrush was apparent in the oral cavity, from which it extended very rapidly to the pharynx and larynx. Altman observed and described a similar case. I saw a case in a child 8 months of age. A very interesting case of thrush in-

volving the larynx and nares was observed in a patient 17 years of age, following an attack of influenza; this case was described by Thorner of Cincinnati; Rosenberg saw a similar case following influenza.

Thrush following diphtheria was seen by Sendziak in a girl 15 years of age. The disease was also seen to follow meningitis, morbilli (Reubold, Sendziak) and scarlatina. I have seen thrush appear on the 6th day after hard instrumental labor. Thrush may occur as an endemic disease in hospitals.

There are many papers on this subject, the majority appearing in France and Germany, but America, Italy, Poland, Holland and Spain also furnish their quota.

Etiology: At the time of Robin's writing, thrush was regarded as caused by oidium albicans—o. lactis. At present we believe differently, namely, that it is caused by mycoderma vini (Grawitz), saccharomyces albicans (Rees), and endomyces albicans (Vuillermin).

According to Plaut, oidium albicans is identical with monitia candida (family, terulæcæ); Vuillermin numbers it with the "ascomycetes" having characteristic spores, and calls it "endomyces albicans." In general, the position of this parasite is undecided.

Infection takes place from ingested objects, from nipples, and less frequently from the air, or the infection takes place during the phenomenon of partus.

Pott connects this trouble with epidemic pharyngitis of cows, the infection being carried by means of the air. Klemperer showed that after the injection of pure culture into the veins of a rabbit, general mould mycosis appeared. Stoos and Grassed agree with his views.

Thrush localizes itself to the oral cavity, the tongue being specially affected (Butlin), principally along its edges and tip. The papillæ are often prominent as red points here, as well as at the base (tonsilla lingualis—Seifert). The frenum is also occasionally affected, while the internal surface of the lips, the angulus oris, the gums and cheeks are also not free from the lesion. The tonsil is rarely the seat of the lesion, although in my cases these were often affected. From these localities the trouble extends by contiguity of tissue downward to the pharynx and esophagus (Virchow, Wagner, Schmidt, Langerhaus and Mackenzie). The last named observed three cases of primary thrush of the esophagus. Zalesky observed one in the

stomach. That it occurs in the larynx, trachea and bronchi, the cases of Schroetter, Massei, Fasane and Sendziak prove.

More rarely it extends from the oral cavity upward to the naso-pharynx involving the pharyngeal tonsil (Thorner). It may spread to the ostium tubarum and fossæ Rosenmuelleri, as shown by the cases of Valentine, as well as my own observation in two cases.

An opinion existed formerly that thrush only developed on mucous membrane, whose covering was of the flat epithelium variety (Berg, Reubold, Butlin, Solis-Cohen, Jules, Semon), cylindrical epithelium not being considered favorable to the development of this parasite. In those cases where it did spread, it was considered as a simple (accidental) extension without really involving the mucous membrane. Against this belief, there are, however, the following facts: the extension of thrush to the mucous membrane of the inferior turbinate bodies, as well as to the septum in cases of hereditary cleft palate, and the extension of thrush to the windpipe, covered with cylindrical epithelium. The cases reported by Siebenmann, Sendziak, Thorner and M. Schmidt, where the localization of thrush was confined to the nose, as well as the larynx—the lining membrane of which is cylindrical—also contradicts this theory.

Clinical Picture: Thrush occurs as small, round, white spots, with small excavations in the center, easily removable at first, later, as the disease progresses, more adherent. These spots coalesce irregularly, forming a sort of membrane of a dirty color, the underlying mucous membrane being red and swollen.

The slighter forms of this disorder last only from 1 to 4 days. A severer type exhausts the patient, the whole oral cavity being covered with strongly adherent membrane, removable with difficulty, and followed by hemorrhage.

The underlying mucous membrane being swollen and red in the acute type—the angina soorica of the French authors—may change to a chronic character, then the mucous membrane loses lustre, becoming bluish, flattened, thickened papillæ of atrophied epithelium.

Symptoms.—The suckling children fail to get sufficient nutrition on account of the pain, they become restless, breathe with difficulty, push the tongue forward, the power of the voice is weakened, exhaustion supervenes, vomiting takes place, the stools are green, evidencing gastric catarrh.

In adults the symptoms are less severe. Massei and Fasane saw symptoms of suffocation from the mould-masses in their cases. Sometimes there is absence of all symptoms (Sendziak), at times simply a burning and dryness in the throat, as well as difficulty in swallowing (Kronenberg).

Oidium albicans is characterized by the existence of small white threads, with double lines and transverse divisions (mycelium) ending in bulbs (sporangiæ) as well as rounded spores. In the membrane we find detritus and epithelium cells. The sections of tissue sometimes show the penetration of the threads deeper into the submucosa, where there are symptoms of reactionary nature.

Differential diagnosis between thrush and particles of food, or component parts of milk are easily made. Between thrush and aphthae we note that aphthae are not so round and have not so regular a form. Diphtheria sometimes shows a resemblance (Schadenwald), but the absence of fever, except in cases of soorica angina, will help to clear up the diagnosis. There is also a less compact membrane and the situation of the membrane itself is of help. From syphilitic plaques it can be differentiated by the concurring skin and lymphatic gland lesions.

Prognosis.—The prognosis is not always favorable, especially in small children where complications easily occur (gastro-intestinal trouble). General infection is also possible (Hubner).

Pürcheimer saw paralysis of the esophagus following thrush. In one of my cases death occurred from acute pneumonia.

Treatment.—The best method is to observe a strict prophylaxis; to keep the nipples clear and systemic cleansing of the oral cavity also are very important. Grozs of Buda-Pest advises the use of 10 per cent silver nitrate in the oral cavity the first day after birth.

Cleaning the mouth in all cases of intestinal catarrh in children and adults is recommended. General treatment is also important.

In many cases local treatment is unnecessary, especially in adults (Sendziak). In children carefully rub the thrush spots with plugs moistened with a weak solution of boric acid. Escherich recommends a solution containing pulverized boric acid

and a little saccharine. Of other drugs, the following are used in this disease: natrium biboricum (3-4 per cent), kali chlor., kali hypermanganicum 0.4 per cent (Schadwald), natrium bicarbinicum 5-10 per cent, lig. alum. acet. pur. (Saltman), sublimate sol. 1:1000 (Kraus), acid carbolicum, naphthol (Cattaert), and finally drugs mixed with glycerine are recommended by Boinet.

In serious cases brushing with kali. iod., sublimate sol. 1 per cent, silver nitr. 5 per cent, pyoktanin 10 per cent, hydrogen peroxide, and finally ferrum chlor. are recommended.

Where the esophagus is affected, the internal application of kali. chlor. are indicated. This must be done carefully. Vichy and emetics may also be given, but caution must be observed for fear of paralysis of the heart. Finally, rubbing the parts clean by means of esophagal sponges may be attempted.

As I have already mentioned, according to the latest researches of the Italian School, of whom San Felice is probably the head, the mould-parasites (oidium albicans) belong to a certain degree to the yeast-parasites (blasto-saccharomycetes).

They rarely occur in man, as a pathogenic agent causing a special kind of mycosis.

The two cases described in French literature belong to this category.

1. Parak's case, where on the fourth day following birth, there appeared on the base of the tongue white spots (thrush?) which under the microscope were supposed to show not the oidium albicans, but a variety of the yeasts.

2. Troisier's and Achaline's case, which were analogous clinically with angina soorica in a typhoid patient, but the microscopic examination also gave a variety of yeast similar to that found in beer-dregs.

Finally there exists in literature some cases of mycosis of the upper respiratory tract which are of uncertain origin and which I report to complete the whole picture of these disorders.

1. Solis-Cohen's case of mycosis of the pharynx of uncertain origin during the course of rheumatic angina.

2. Klaman's case, cited by Schech, grey-yellow membrane on the posterior arch as well as on the uvula composed of mycelium and cocci (the threads having mace-like ends).

3. Hall's case: mycosis fungoides of the pharynx and larynx (arytenoid cartilages) in a patient 52 years of age, and finally

4. Hallspeen and Jeanselmes's case with autopsy, mycosis fungoides of the left posterior arch, tonsils, faucial as well as lingual, aryepiglottic folds, epiglottis, and vocal cords.

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XXXVIII.

REVIEW OF MASTOID CASES OPERATED IN AURAL SERVICE OF BOSTON CITY HOSPITAL, OCTOBER, 1903, TO MAY, 1904 (Inclusive).*

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BOSTON.

To the Aural Department of the Boston City Hospital is given the care of what cases are admitted to its service in the main hospital, also the care of those aural complications which may arise in other patients both in the main hospital and in the contagious department. From October 1, 1903, to May 31, 1904, at the main hospital, and from the same date through the summer of 1904 at the contagious department, the service was exceptionally heavy as to numbers of cases, and also included some of more than ordinary interest. Of cases coming to mastoid operation during this period there were in the main hospital forty-two cases (one having a double mastoid) and in the contagious department twenty-four cases (three having the double operation). Thus there were seventy cases of mastoid operation in the aggregate. In these there were but three deaths; one from cerebellar erosion or superficial subdural abscess, one from meningitis with acute cerebral edema probably (no autopsy allowed), and one case of diphtheria, in which pneumonia developed and was the cause of death one week after operation. The ages of these patients were between thirteen months and forty-six years at the main hospital; and between about ten months and twenty-eight years at the South Department.† At the main hospital there were twenty-one males and twenty-one females; at the South Department nine males and fifteen females. At the main hospital the right side was operated twenty-four times, left seventeen, both sides once, and one not given. Among the contagious cases, right fourteen times, left seven and both three.

It is interesting and instructive to note how frequently

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† The South Department is another name for the contagious department.

the classic symptoms were absent so that in some of the cases with no redness, swelling, nor marked tenderness, the mastoid process was found nevertheless full of disease, and here at the main hospital there were twenty-four cases of acute discharge (in which it was induced by paracentesis of the drum-head eleven times) where pain was absent three times, edema seven times and bulging of the posterior wall nine times; while in four cases both superior and anterior wall were bulging in addition to the posterior, and in three other cases the superior and posterior wall, bulging into the lumen of the canal.

Among twenty-four cases in the South Department there were eighteen cases of acute mastoiditis. These were almost all accompanied by the ordinary symptoms of redness, edema, tenderness and pain as is usual, but in three patients (two being children, aged twenty-two months and three years respectively, and the other a woman twenty-eight years of age) there was, on admission, an absence of pain, temperature, tenderness and swelling over the mastoid. One of them only had a bulging of the posterior wall, but two had bulging of the superior wall of the canal. This woman of twenty-eight years of age, a case of measles, had no affection of the ear till suddenly pain with probably effusion occurred in the left middle ear with a swelling of the mastoid almost immediately. Her maximum temperature was only 102°. She was seen about noon and was ordered to be prepared for operation in the evening. At that time there was congestion and a slight bulging of the drum-head with marked tenderness and swelling over the mastoid; temperature 102°. At the evening when she was brought to the operating table, her temperature had diminished to normal, there was only a slight congestion of the drum-head and but a slight tenderness on deep pressure over the mastoid. There was doubt as to whether an operation would be necessary, but as she had had the symptoms mentioned it was concluded that that meant mischief, and as involvement of the ear in measles has been found to be especially treacherous, it was deemed best at least to ascertain whether there was anything of importance in the bone or not. The usual incision was made, the periosteum came away with great ease revealing a roughened bone surface with a small perforation leading through it into the mastoid cavity, the periosteum evidently having been separated

from the bone and then unaccountably replaced. The cortex was removed with a sharp spoon, the cavity found to be full of granulations bathed in pus; and the whole interior was thoroughly cleared out, irrigated and packed. The others were cases of scarlet fever and showed a similar absence of the usual signs of mastoid involvement. These cases point the argument that we cannot always tell from external symptoms how much destruction is going on where suppurative conditions have attacked this region in the exanthemata. From these and from other experiences in the same line it seems to us to be the best plan to operate on mastoids which have shown during the current exanthematous disease symptoms of acute involvement, even though they have apparently been allayed.

This brings up the question of the efficacy of the use of the ice-bag in acute involvements. In cases in the main hospital it is the routine procedure when tenderness appears on the bone to use the ice-bag not longer than forty-eight hours lest it mask the symptoms and give us false sense of security while the disease may be progressing. After this length of time it is left off and usually if the pain and tenderness recur it may be tried for a few hours longer, but generally it is considered that the operation should be performed especially when the second recurrence of edema makes it manifest that there is pus in the deeper tissues. In the South Department, on the other hand, where there is a marked virulent infection, if the temperature keeps up, the ice-bag is not relied upon to abort the disease, but with the other symptoms, or even in the absence of other symptoms, with a history of acute inflammation, even if they have subsided, as mentioned above, the operation is advised in every case; and it must be further said that in the great majority of cases, probably in all of them, are found conditions of which it would be futile to expect resolution.

Among the nineteen chronic cases there were seven with pain, ten with tenderness, thirteen with external edema fourteen with bulging of the posterior wall; the superior wall was sunken only three times and the anterior but twice. And it is very significant that in six cases where there was neither pain, tenderness, nor bulging of any inner walls, there were found pus and granulations in the mastoid process, and in three of those the lateral sinus was, or had to be, exposed, because of a carious inner cortex, and in four only was a

sclerotic or eburnated bone mentioned. Of these nineteen chronic cases only four complained of headache on admission, and only five had a temperature of 100° or over, only two having 102°, and one of these was the case of cerebellar abscess, to be further mentioned. Of the other four cases two only had an external cellulitis; and two had probably slight septic absorption, as the inner cortex was carious or absent.

In all of these chronic cases except two there was a history of pain before admission, and in one other the history is doubtful. But in all of them at the operation were found granulations in the mastoid antrum, and in the mastoid process unless it was sclerotic, and in most of them free pus. Hence the symptom most significant in these cases of chronic purulent middle ear catarrh is the discharge. The middle ear cavity is very small, probably not large enough to contain more than a very few drops of fluid. If there is enough to run out into the external ear or auricle, or even to run down on the face or stain the pillow at night, it is reasonable to suppose that there is more chronic inflammatory involvement than of the middle ear itself; *i. e.*, that it extends upward and backward through the aditus and involves the antrum. Nor is a copious discharge only significant of deeper involvement. It may also happen that the slight amount of discharge, which is not sufficient to run out but only to remain in the fundus of the canal to decompose and become foul, being in a deep warm narrow canal, is also significant of continuous caries which may insidiously extend deeper and deeper into the cellular mastoid process, to suddenly appear on the inner cortex and there to set up a localized meningitis, or a mild pyemia from absorption through the walls of the lateral sinus. It will be seen from the above that the chronic cases, especially those where the discharge is not sufficient to be obtrusive, are in a more or less dangerous position, if the presence of the usual conventional symptoms are relied upon exclusively, as the only one noticed may be pain which is so often disregarded or treated at home (which is frequently the same thing) by external applications, or what is far worse, by dropping into the external canal certain abominations such as laudanum, sweet oil, hot onion hearts, etc.

It is well to call attention here to one of the reasons for opening the mastoid given by Sir William Macewen, at the

International Otological Congress at London in 1899, because he clearly showed the weight of certain symptoms in cases of chronic purulent discharge, which may have other interpretations; and the evidence of which was only elicited in some of our cases by careful investigation, because such symptoms are usually not attributed to the ear, and also because of the rather obtuse intelligence of some of the patients who are unaccustomed to very carefully observe their mild sensations.

He says: "The pyogenic process may, however, proceed inwards, giving rise to symptoms often misunderstood or attributed to other causes, and may eventually prove fatal or, by undermining the constitution, thereby pave the way for the advent of other lesions. Many patients thus affected, though able to pursue their usual avocations, are yet subject to periods of malaise, with occasional recurrent slight febrile attacks; irritability and nervous hyper-sensitiveness exhibited in unevenness and irascibility of temper, which attacks last from a few days to a week or more, leaving the patient slightly weaker, though relieved from the depression and fit to enjoy life. These attacks are so frequent, and the patient becomes so used to them, that he comes to regard them as a part of his ordinary habit, and often attributes them, with considerable plausibility, and sometimes with point, to colds, chills, biliousness, indigestion, etc."

Hence it will be seen that there is a certain line of cases demanding operative interference where symptoms consequent on slight suppuration are very obscure. The assistance of the thermometer here is very marked, since during these chilly states, or when the patient is suffering from malaise, it may show a slight elevation which may be transient and occur at irregular times of the day. If it were possible, it would be advantageous to have blood counts made at these times, but as yet such opportunities have not presented themselves.

In the twenty-four cases at the South Department there were five (one being double) where there was a chronic discharge before entrance. These cases, of course, were excited into acute exacerbations by the exanthem from which they suffered, and hence the obscure symptoms mentioned of those cases occurring without this complication in the main hospital were masked, and they all had the ordinary classic

symptoms of pain, tenderness, mastoid edema, and bulging of the walls, which are found in cases of acute mastoiditis; and here also at the operations were found carious bone and pus and granulations in the mastoid processes, the same as in the other chronics; but in none of them, as they occurred in younger children (all being under seven years of age) was the inner cortex found to be softened or absent.

The exceptional success in these cases in respect to mortality is probably due principally, in the minds of the operators, to the fact that all of the diseased tissue was removed, every vestige of carious bone or purulent infiltrated or inflammatory tissue wherever it extended was thoroughly scraped away, so that the mastoid process itself was almost invariably left as nothing but a very thin shell. This cavity was packed and allowed to granulate in most of the cases, both acute and chronic. A few radical operations were done and these were grafted in the usual manner with skin removed from the inner aspect of the thigh above the knee, but there were ten cases (nine in the main hospital and one in the South Department) allowed to fill up with blood clot, and the wound sutured immediately. Of these cases one in the main hospital, a feeble-minded, ill-nourished individual of three and a half years of age, broke down in twenty days, and two others sloughed within a few days; and one, a well-nourished woman twenty-three years old, who had the double operation, left the hospital and within a month it was reported that her left mastoid had sloughed. One in the contagious department was a case of measles where the clot also broke down. It seems, therefore, that one-half of the cases were successful and that these have not given trouble so far as known. It may, therefore, be asserted from this and subsequent experience that this procedure of Dr. C. J. Blake's sometimes produces a very quick cure after the mastoid operation; and also that even when the clot breaks down, that part of it which lies contiguous to the bone surface furnishes quick and satisfactory nourishment for the new granulations, and for the new growth of osteoblasts, so that they have been very much hastened and therefore the length of time for healing very much diminished. Moreover, in some cases where the granulations seem to be sluggish, flabby, pale and ill-nourished they have been bruised and the blood clot allowed to remain, *i. e.*, they have been dressed in their own blood, as it were, and in these cases

the healing has evidently been accelerated.

The length of time during which patients have remained in the hospital varied very greatly, from nine days after the clot operation to one hundred and fourteen days, the latter having been caused by many complications. Some of these cases have also had to be operated upon a second time because of the spicules of carious bone which may have separated subsequent to the operation, or because plastic operations have been necessary.

Among these cases were four of the Bezold variety with pus infiltration down the neck through a fistula in the digastric fossa. One of these was operated in one of the surgical services for a deep abscess in the neck and afterwards transferred to the aural service to have the *fons et origo mali* removed, which was done by the thorough removal of the mastoid process except the inner shell. The other three cases were operated on as for an ordinary mastoid except that the inner cortex in the digastric fossa was removed, exposing the insertions of the muscles in this vicinity and the tract of pus exit probed, and the pus pressed upward from below when it was indicated. This procedure was found in each case to be sufficient for drainage and the cellulitis rapidly subsided, in no case necessitating any operation in the neck. This would seem a priori to be insufficient as a surgical measure, but when it is remembered that the patient is in the recumbent position for a number of days, it will be seen that the pus, seeking its easiest passage, has the assistance of gravitation almost all of the time; and that this, assisted by the natural contraction of the muscles and tissues of the region, is evidently sufficient to drain the abscess, even though in an upright position, it is dependent.

In addition to this general review the following cases present some points of interest and are herewith reported more or less in detail.

Case. 4. Otitis media purulenta chronica with cholesteatoma. Complete exenteration. Four operations. Eighty-two days in hospital. Discharged well.

Edw. C., fifteen years. Admitted November 16, 1903. Has had purulent, odorous discharge from right ear for many years, of which the history as also that of the pain are indefinite, till ten days ago when an acute exacerbation seems to have taken place with great pain and swelling behind the

ear. On admission, temperature 98° with pain in and around the right ear, tenderness and edema over the mastoid process.

Operation on the 17th. Usual incision through the periosteum gave vent to considerable pus and came down upon superficially eroded bone, with carious openings into the mastoid process which was a large cavity with partially absorbed trabeculæ between the pneumatic cells, and was filled with unhealthy granulations, much débris, and foul cholesteatomatous masses, some of which were so adherent to the bone as to give the appearance of black stains. The inner cortex was soft, in places absent and the lateral sinus, with a greenish gray opaque wall, lay in the bottom of the wound at completion of the operation, but was soft, yielding to pressure with finger, though not pulsating. Cavity gently irrigated and packed with iodoform gauze, and patient put to bed to await developments, *i. e.*, possible signs of lateral sinus involvement. These did not appear and the highest temperature reached was 101.5°. At the subsequent dressings the newly formed granulations showed that the cholesteatomatous infiltration had not been wholly eradicated, a very difficult process in an old case; and this was not wholly removed by the use of peroxide of hydrogen and strong antiseptics. Hence on the 29th of November under ether a complete exenteration was done, attic, middle ear, etc., all thrown into one cavity and thoroughly curetted. A probe found a dehiscence in the Fallopian canal and caused twitching of the muscles of the right side of the face. The wound was not closed because of the possible recurrence of the cholesteatoma, but was packed with iodoform gauze. At the dressings the wound now appeared clean, and on the 12th of December under ether the granulations were smoothed down and the interior covered with Thiersch grafts. These took quite well and no appearance of this septic epithelial debris resulting, the posterior wound was closed under ether on the 20th of January. Healing was complete and he was discharged well on the 6th of February.

This case shows how much infectious material may be carried around for a long time without apparent danger, and how much trouble there may be in its eradication.

Case. 8. Otitis media purulenta chronica; bloodclot dressing.

F. T., male, forty-six years of age. Admitted January 4, 1904. Measles in childhood; left ear discharged for four years afterwards; right ear began discharging twenty-eight years ago; has had occasional attacks of pain with irregular periods of discharge since.

Examination. Left ear shows cicatricial drum-head, right ear perforated drum-head with marked bulging of posterior wall.

Operation January 5th. Large amount of carious bone and granulations removed, cavity scraped clean as far as the end of the aditus, care being taken not to enter the attic; cavity allowed to fill with blood clot and wound sutured both through the skin and periosteum, a small hole being left below, in which a small wick was inserted to remove the more fluid parts of the blood to insure a firm clot. Healing by first intention; wick removed in about three days; excavated area feeling solid to moderate pressure. Duration of time in hospital fifteen days, but could have been readily reduced to eight. He was, however, detained in order to be sure that there was no immediate breaking down, and was discharged in fifteen days solidly healed and apparently restored to his usual health with the middle ear only slightly moist. So far as known this case has not given any further trouble.

Case 10. Otitis media purulenta chronica. Bezold mastoiditis.

T. M., male, thirty-five years of age; admitted January 16, 1904. Left ear has discharged for a year. For two weeks has had steady pain in the ear and through the head, with some soreness on the right side. Has small dermic swelling of the left auricle, probably eczematous, not due to erysipelas. Temperature on admission 102°. Narrowing of the external canal, especially of the posterior superior, and anterior inferior walls. Considerable pain referred to behind the ear (left) with slight edema and considerable tenderness. It is rather difficult to see whether the narrowing of the canal is due to edema, or to the inflammatory process, although probably both are factors. On account of the temperature and the indefinite history of fever with slight chilliness, blood count was made and found to show 14,000 whites. Examination of the eyes showed fundi normal; examination of the left ear showed an old cicatricial drum-head with perforation, although not easy to make out because of swelling

of the canal. The mastoid process was somewhat swelled, especially in the lower part; this swelling extended one-half way down to the clavicle, very tender to the touch, brawny and tense.

Operation on January 17. Cortex, after removal of the periosteum, bled from many points. The attachment of the muscles was very dark and freely bleeding. Removal of the cortex revealed the mastoid process full of granulations and broken down débris. The antrum was especially full of old fibrous granulations. The bone over the digastric fossa was soft; removed; a small amount of pus was evacuated. Posterior cortex about the same; also removed, exposing the lateral sinus. This case went on to satisfactory healing; the swelling in the neck disappeared, drainage through the mastoid wound being amply sufficient.

Case 15. Otitis media acuta. Mastoiditis. Beginning Bezold. Blood clot dressing. Recovery.

F. M. C., female, twenty-two years of age. Admitted February 5, 1904. With no history of previous ear disease, severe pain began in right ear three days ago. Paracentesis was done at Boston Dispensary. For next two days severe pain in ear, running down neck, with chills, but no marked rigor. On admission temperature 100°. Profuse sero-pus discharged from the right ear. Perforation in lower posterior quadrant, through which the discharge pulsated. The lower half of the mastoid and the upper third of sterno-cleido-mastoid region were swollen, red, tender and rather stiff. This infiltration was present in right side of the throat, which looked swollen, and opening the mouth was painful and restricted, suggesting inflammatory involvement of the tonsil.

Abortive treatment was attempted, ice bag, hot irrigations, rest in bed, restricted diet, etc., but operation became necessary on the 13th of February. Highest temperature 102°.

The mastoid process consisted of hard bone with small cells, the bone being inflamed and bleeding much. There were few granulations in these cells and in the antrum. The bone was cleared out till it was yellowish white, with no bleeding or oozing spots, and allowed to fill with blood clot furnished by the vessels around the incision through the soft parts and the incision then sutured, a small wick being left

in the lower part. Healing by first intention, and the patient was discharged in thirteen days after the operation.

Contrary to our usual custom this patient was not operated upon immediately, but it is evident that eight days would have been saved if she had been.

In this case also we have the tendency of the suppurative process to point inward, as shown by the marked cellulitis down the neck, even presenting inside, which involved the posterior belly of the digastric muscle.

Case 16. Otitis media purulenta chronica. Facial paralysis. Polypi. Bezold mastoid. Erysipelas. Recovery.

S. H., female, forty-five years of age. Admitted February 26, 1904, a very large, fleshy woman. Her left ear has discharged more or less for thirty-nine years with unnoted pain, but has had no treatment. Five days ago pain was quite marked, with swelling and tenderness behind the ear, and soon afterwards the face began to turn towards the right. On admission, temperature was 100°. Discharge somewhat from the left ear, with polypi filling the whole of the external canal. Behind the ear, much swelling and tenderness, which extends considerable distance down the neck; also above and around the ear, hard, brawny, pitting on pressure, which is quite painful. There is complete paralysis, facial, on the left side. The canal narrowed by edema of its walls but slightly. Eyes examined and slight choroidal atrophy reported with some congestion about the discs.

Operation the same day revealed a good deal of free pus and granulations in the large pneumatic mastoid with peripheral bone easily bleeding. The facial canal and the horizontal semicircular canal were exposed, inflammatory carious tissue being gently scraped away from the region of the former, digastric fossa exposed and sinus leading downward gave exit to a considerable amount of pus. The wound was packed with iodoform gauze. February 29, the temperature rose suddenly and erysipelas developed. Transferred to Ward I, and usual treatment instituted.

March 1. Temperature still elevated, white count shows 36,000.

March 2. Temperature 103° to 105°, rather more swelling down the neck, the wound dressed and quite a large amount of pus evacuated from the fistula through the digastric fossa. After this date symptoms gradually subsided, swelling in

the neck diminished, facial paralysis disappeared, the wound granulating satisfactorily and she was discharged relieved; that is, the wound not completely healed, but to be dressed at the Out-Patient Department, March 22.

Case 20. Otitis media acuta. Mastoiditis. Epidural abscess. Recovery.

Thomas P., twenty-eight years of age. Admitted March 1, 1904. Seven weeks ago began to have pain in left ear, followed by discharge. One week ago tenderness and swelling behind ear, extending forward on to the cheek and down the neck. Considerable headache but no vertigo, nausea or vomiting noticed.

On admission, temperature 100°, with pain in and around the ear with tenderness and edema, and also edema of the bony canal walls, posterior, superior, and anterior. Auricle displaced forward and down. This swelling extended half way forward on malar region and considerably down the neck. There was a perforation through the drum-head and a copious discharge.

In the evening had a marked chill, temperature 103.2°, afterwards moderate perspiration. White count showed 20,000.

March 2. Another chill with vomiting, temperature 103°, to 105.6°. House officer, however, reported only 5,000 whites.

Operation. Purulent collection subperiosteal, rough bone, carious opening into a cavity which took the place of the mastoid bone, and was filled with pus and granulations. The inner cortex was rather soft with loss of continuity, the removal of which revealed an epidural perisinous abscess, with the inner wall covered with protective granulations. The tegmen antri also easily came away, showing slightly discolored dura.

Wound thoroughly cleaned with hot sterile irrigations gently applied and packed with iodoform gauze. Recovery uneventful. Discharged on March 17.

In this case may be seen what alarming symptoms may be called forth by merely superficial conditions, the thorough removal of which is sufficient to abolish them all. It may be well questioned whether the sinus, covered as it was with granulations, did not admit pus enough to cause the chills and high temperature; and so it might have been considered

that a beginning thrombus, at least a mural one, was in process of formation, and an excavation of the sinus called for, as has lately been advocated under similar conditions.

The result eminintly justified the conservative course pursued.

Case 23. Otitis media purulenta chronica, with attic and antrum involvement. Cerebral symptoms. Operation. Recovery.

Ellen C., twenty-nine years of age. Admitted March 4. Seven years ago pain and discharge from left ear. Ceased in three months. Afterwards hard of hearing. Recurrence one year ago, with headache, profuse discharge, chills, vertigo (tendency to fall forward, never sidewise), and vomiting. This attack lasted three weeks. After this always had discharge with colds, but no other trouble except deafness. Three weeks ago, following a cold, pain in right ear with headache and soreness of the whole head, with nausea and vomiting on afternoon of March 2 and 3. Paracentesis was done on March 2. Temperature had been between 99.2° and 101.5°.

On admission, temperature 99°. Complains mostly of tenderness and soreness of whole scalp, especially marked over right temporal bone, and over right mastoid tip, which is exquisitely sensitive. Back of neck is sore also, but not stiff. Vertigo is marked on moving head, sitting up or lying down. Photophobia present. Eyes normal, both as to external movements and ophthalmoscopic appearances. Some chilliness during the evening, no rigor. White count shows but 7,600. Examination of ears shows right membrana tympani slightly bulging, swelling most marked in membrana flaccida, with redness of contiguous walls of canal, no discharge. Agglutinated paracentesis opening in inferior posterior quadrant. Canal wall tender and slightly red. Left ear shows absence of membrana vibrans, with profuse whitish sero-purulent foul discharge, suggesting cholesteatoma. Membrana flaccida white, moist, underneath which may be seen a dirty, yellowish substance. Posterior wall red, swollen and tender to pressure with cotton applicator.

Under small amount of ether the posterior segment of right membrana tympani was severed, and two incisions made horizontally in Schrapnell's membrane, one each side of the neck of the malleus. Ice bag to right mastoid and hot irrigations.

March 5. Considerable relief to right ear. Doctors P. C. Knapp and J. J. Thomas, in consultation, opined that there was no meningitis, but possibly an extra-meningeal (pachymeningitis) pressure or involvement of the labyrinth and no localizing symtoms of brain abscess.

March 6. Operation. After removal of periosteum, cortex normally white and glistening, bone sclerosed, especially forward and above, large antrum with hard, gritty walls, full of old granulations, no pus. Thoroughly curetted and walls made smooth, also aditus enlarged, forward and upward, and smoothed well into the attic. Cavity packed as usual. Patient complained of much headache after operation and was very nervous, but aggravating symptoms rapidly subsided and she made an uneventful recovery, and was discharged relieved, after twenty-four days in the hospital, wound nearly healed, and middle ear nearly dry. The right ear gave no further trouble.

In this case is seen what aggravating and truly alarming symptoms may be induced, especially in an intensely nervous woman (though by no means confined to such) by pressure in the attic brought on by slight acute inflammatory conditions, as witness those in connection with the right ear; also how similar disturbances may be brought about by a slight increase in the size of chronic granulations in an old mastoid antrum, the only other evidence of which may possibly be a chronic intractable, recurrent discharge. Cases like this also differ from those so succinctly described by Sir William Macewen, in that symptoms are evidently caused by pressure rather than by absorption.

Case 34. Otitis media acuta with mastoiditis; sluggish infection; much delayed operation; acute cerebral edema (?); death.

Elba C., twenty-seven years of age, a spare Swedish housewife, was admitted to Ward O. (P. R.) with a history taken from private notes. She was sent to me by Dr. F. S. Parsons of Dorchester, March 7, 1904. Never had trouble with ears before except slight ear-ache a year ago which only lasted a day and left good hearing.

Thirteen days ago, "with an awful cold," a regular ear-ache began, very severe for about a week. A blister seemed to give some relief. Thought it was an abscess but it did not discharge, and is now very deaf. At first was very dizzy and

had six or seven vomiting spells. Could not walk for first three days and had to remain in bed. Considerable pain at night, so that she had not slept more than an hour or so. Was sore all over left side of head for a few days and had much pain and tenderness behind ear. First day was chilly; now complains mostly of tinnitus.

Examination shows left membrana tympani very thick, dull red, posterior segment bulging and contiguous parts of canal also red and swollen. A large paracentesis was made, evacuating bloody serum; irrigations every two hours, with sol. corrosive sublimate, 1 : 4000.

March 21. Has been free from pain even at night since last visit. Less tenderness of mastoid. Paracentesis opening discharging yellow pus. Posterior wall of bony canal red and slightly swollen. Membrana tympani much swollen so that the hammer handle is deeply sunken between the two halves. Mastoid operation advised; declined because wishes to return to Sweden for the summer vacation. To use ice to mastoid.

March 23. Ice removed nocturnal pain; but had some pain yesterday, "not to speak of."

March 26. Much pain for two hours last night; but mentions throbbing through the head. Slept last half of the night; only five or six drops of discharge last night and none yesterday at all. No increase of discharge after pain. A. A. S. Three and one-half feet; inflated with Politzer's, A. D.; nine feet. Membrana tympani very red and thick, slight pain after P. A. D. and a small amount of discharge blown out. No visible perforation. Nose free; region of Eustachian mouth treated with astringent solution.

April 2. Has had less discharge; no pain, but headache over eyes for two or three days off and on, but has this pain quite often. Less tinnitus, less soreness of mastoid, membrana tympani very thick, depressed at umbo with small pouting perforation in posterior segment. Hears A. A. S. 20 inches, inflated with Politzer's A. D. four feet.

April 8. Has no more pain but discharges at night a very little. Still slight tenderness of tip of mastoid. Hears A. A. S. five feet; after P. A. D. three or four times, thirteen feet. Still refuses to consider operation, which is urged for safety.

April 18. No pain, slight discharge still but more running at night. Mastoid tenderness back of tip and over antrum. Slight sensation of stiffness on opening mouth.

April 20. Increase of pain in ear. Pouting perforation larger and membrana tympani still very thick. Mastoid quite tender. Large paracentesis. Only blood evacuated. Sent to hospital for operation. Entered same day. Temperature 98.5°. Profuse discharge. Large cut through posterior segment of membrana tympani. Redness and edema over mastoid; canal, posterior wall thick and red. No head symptoms noted.

April 21. Operation. Cortex white, hard, thick; removed; bone pneumo-diploetic, large cavity cleared out with lateral sinus bony wall deep posterior. Many pockets of pus with large superficial air spaces extending backwards almost to the occipital bone and forward into zygoma. Antrum full of pus, granulations and bony spicules. Diseased bone curetted away till horizontal semi-circular and facial canals came into view. External canal and mastoid cavity thoroughly irrigated and wiped out and the whole packed with iodoform gauze.

April 23. Temperature elevated all day, about 101°. Vomited a good deal. No other symptoms suggested intracranial complications.

April 26. Wound dressed, clean, granulating. Temperature 100.2°.

April 28. Temperature 99°.

April 30. Temperature normal.

May 2. Up in chair. Wound clean, granulating, healthy.

May 6. Same report.

May 8. Walked in from an airing out on the bridge between Wards O and D apparently dazed, but seemed to recognize every one, this condition of slight lethargy being attributed to neurosis, or a sudden neurasthenic condition. Pupils equal, react normally. Knee jerks not increased. Tongue normally protruded. Temperature 100°, pulse 84.

May 12. Remains in about the same dull condition. Talks occasionally; rather brighter; vomited twice; complains of headache.

May 16. Improved mentally. Wound clean, granulations healthy, filling in well.

May 20. Mind duller; difficult to form sentences; slight aphasia; cannot tell what she wants; slight headache; vomited once or twice in last two days. Temperature normal. Examination of eyes show fundi normal.

May 21. Slight improvement. Seen by Dr. G. G. Sears, who said the question was between meningeal irritation and exhaustion psychosis, or some other cerebral condition.

May 23. Seen by Drs. Knapp and Courtney, who diagnosed an abscess in left temporal lobe and advised operative exploration.

May 24. About the same lethargic state though answered questions and talked a little. More uncontrollable dark green vomiting. At 11 A. M. dull, listless, twitching of muscles, with whole right side rigid. Temperature 100°. Coma supervenes. After much persuasion husband allows further operation; well set and copious granulations cleared out of mastoid. Incision made three inches upward from mastoid opening, separated, and an opening made above the tegmen with rongeur forceps 1½ inch in diameter. Dura bulged into opening, tense, normal color, not pulsating. Dura opened, brain substance protruded and then began to pulsate very rapidly. Director passed in deeply in four different directions; no abscess contents nor cavity found. Brain then began to protrude rapidly more and more and was very tense. Exploration with finger advised against. Bandage applied with pad, very tightly. Taken to bed. Ten minutes later cyanotic; pulse 150; irregular; and death ensued in about half an hour after operation.

No autopsy was allowed.

In this case we were confronted with the obstinate refusal of an operation when a comparatively simple one would probably have saved the life. Moreover, this is one of the class of cases where the affection of the middle ear seems to be such that vigorous, ordinarily approved treatment seems to be powerless, at least outside of constant hospital care, to abate the results of a rather sluggish infection. That this infection was sluggish seems to be proved by the long continuance of the disease (from March 4 to May 24) without more marked virulent symptoms. It is to be regretted that a bacteriological examination was not made, for after the infection became mixed, it was too late for satisfactory data. It also shows what a dangerous combination is a thick drum-head with a pouting perforation, and a thick, white, ivory-hard mastoid cortex.

Case 36. Otitis media purulenta chronica, with posterior auricular fistula leading to carious mastoid. Operation. Recovery.

Frank W., aged eight years. Admitted February 19. Well nourished and otherwise a healthy boy. Was operated on at this hospital at one and one-half years of age for acute mas-

toiditis on right side. Ear has discharged ever since. Mastoid wound was very long in healing and sinuses have broken out and discharged at intervals ever since, the last one persisting. On admission temperature 98°. No complaint of pain or tenderness but only the persistent, annoying discharge both from the canal and from a post-aural fistula.

Examination shows a large perforation of drum-head. Probe enters a defect in scar of previous operation and detects plenty of rough bone, passing in deep enough to reach the antrum; and, bent, can pass forward into the aditus.

February 20. Operation. Incision through the old scar. Large passage bounded by hard, bony trabeculæ leads to antrum which is walled in by hard bare bone, all evidently newly formed bone embedded in soft granulations bathed in pus. A large part of the previously excavated cavity had evidently likewise been filled in with bone. This was scraped away down to smooth, hard bone, the lateral sinus being exposed, and also the horizontal semi-circular and facial canals.

The wound was so clean that it seemed well to dress with blood clot; but the cavity having been so long infected and the middle ear accessible through the aditus, it broke down in four days. The wound was then opened, and cavity packed as usual, but the inner surface of the cavity was well covered with granulations.

March 8. Discharged, nearly healed.

This is reported as an example of a fortunately not common class of cases in which a secondary infection takes place through the middle ear, and when it is considered that this already infected, or from the throat easily reinfected cavity, may not be wholly shut off from the mastoid by a bony or fibrous plug in the aditus, it is not far from strange that this untoward event does not more often occur.

The preservation of every possible amount of hearing is reason enough for avoiding any further destruction in the middle ear, and hence, the risk of reinfection of the mastoid seems to be unavoidable, till some better means is devised for separating the two cavities.

Case 6. Otitis media purulenta chronica. Recurrent mastoid. Chronic superficial cerebellar abscess. Operation. Brain exploration. Death.

John B., nineteen years of age. Admitted December 30, 1903. Strong, well developed and nourished, of good color, a civil

engineer. Of a phlegmatic disposition, rather slow, gave the following history:

Right ear has discharged off and on for six years, exacerbations preceded by pain, and once followed by abscess behind the ear, which was opened by family physician without anesthesia. For the last five years has had occasional attacks of severe pain in right ear, accompanied by fever, and followed by foul discharge for a day or two. The pain, fever and discharge soon subsided. Was on these occasions treated by family physician, who at times opened the abscess (paracentesis?) followed by syringing.

An attack similar to the above began two and a half weeks ago, except that the accompanying severe headache remained general, *i. e.*, was not confined to the right side. Was able to be up and about the house for a few days, during which the headache was so agonizing that he seemed to spend most of the time with his head bowed resting on the table. For a few days before entrance spent considerable of the time in bed. Two days ago temperature 102°. Pain then became localized at the occiput radiating to the middle of the back between the scapulæ. One quarter grain morphia relieved the pain. Three days ago, at 8 P. M., on going to bed was chilly, had some perspiration around the head, but no marked sweating. Took morphia, one-eighth grain, 5 A. M. to-day, and this was vomited immediately. It was then given subcutaneously and repeated at 7 A. M. Vomited again at noon. Was sent then to hospital by Dr. Currie of Cambridge. Has had no dizziness and walked to carriage without support. Admitted at 4:45 P. M., temperature 102°, pulse 100, good volume and tension.

General examination: Lies on his back, legs extended, not restless, knee-jerks normal, no ankle clonus, no Babinsky, no Kernig signs; marked stiffness of neck. Eyes: Movements normal, pupils equal and react to light and accommodation; nose normal; other organs normal; tongue coated.

Local examination: Left ear, membrana tympani thick, otherwise negative. Right ear, a V-shaped scar on mastoid process. No depression, no redness, no edema, no tenderness. External canal reddened at the junction of cartilaginous and osseous portions near membrana tympani; redness and bulging of posterior superior and anterior inferior walls, so that membrana tympani is seen with difficulty. Considerable dry secretion with foul odor wiped away with a cotton applicator,

also some blood showing presence of granulations. Blood count was made by house officer, whites 24,000. Ophthalmoscope showed fundi normal.

Operation 10:30 P. M. Usual mastoid incision exposed rough carious cortex, which was removed with a curette exposing a cavity three-quarters inch deep, three-quarters inch wide, filled with foul cholesteatomatous masses of the consistency of cream cheese and about the same color. The whole of the mastoid was soft from caries and was removed, and a large and free communication was established with the middle ear through the antrum and the aditus. No fistula through the tegmen found, and communication not made. Incision was enlarged one-half inch backwards and upwards, the emissary vein exposed and found healthy. The posterior inner cortex of the cavity removed, and the lateral sinus exposed to the bulb, epidural abscess sought with a probe but not found, sinus wall of dark, opaque yellow color, no pulsations seen nor felt. The wound was irrigated with normal salt solution and packed to await further developments. Patient left the table in good condition. Pulse 90.

December 31, temperature 100°, pulse 70. Expresses himself as feeling better. Rigidity of the neck same, cannot flex the head. At the visit temperature 99½° to 100½°. Blood count shows 16,000 whites.

Examination of the eyes shows fundi normal; slight rotary nystagmus observed at 6 P. M., increased by looking upward and outward, more marked to the right. Has pain only occipital, somewhat restless, lies curled up in bed, both knees flexed; cerebration slow.

January 1, 1904. Slightly better and mind more active, prefers to lie on left side with knees flexed. Drooping of upper right eyelid. Slight paresis of external and inferior recti and probably of internal rectus of left. Nystagmus increased on looking upward and backwards over to right. Diplopia. Facial paralysis evidenced by incomplete closure of right eye and less strength of the right side of the mouth. Stiffness of the neck same. Blood count 16,000. Pulse 68 to 80. Temperature 95° to 102°. Fundi slightly hazy at the inner side of the disc. Seen by Dr. Prince, who says either abscess or meningitis.

January 2. Middle of forenoon no change. Wound dressed at 2 P. M. Very foul. Peroxide of hydrogen used. In the

afternoon pupils dilated and react. Right larger than left, other eye symptoms and fundi the same. Pulse and temperature are same. Blood count, whites 12,000.

January 3. At 1 and 7 A. M. and 2 P. M. vomited. Had restless night, complained of pain in right eye, which soon disappeared. Drs. W. N. Bullard and Morton Prince called in consultation and advised exploratory operation. The previous wound was opened; considerable cholesteatoma removed. Incision enlarged backward one-half inch, periosteum elevated. Emissary vein cut. Blood stopped by hemostat. Trephine opening made one inch in diameter behind sinus and below linea temporalis. Button of bone removed. Dura of normal color under slightly increased tension; incised, laid back. Cortex of brain normal. Explored in four directions; downward one inch, backward and inward one and one-half inches each; forward with curved trocar about two and one-half inches. In this direction trocar was not passed further in under advice of neurologist. Mastoid wound enlarged upward upon squamous portion of temporal bone, which was removed with forceps exposing a large area. Dura and brain apparently healthy, explored with sterile trocar in several directions of varying depth. No pus found anywhere. Dura flaps sutured and also external wound except in the first mastoid incision. Returned to bed. Pulse 140.

10 P. M. Pulse improved; four hours after the operation pulse 98, feels well.

January 4. Feels stronger; increasing strength through the day. Pulse 70 to 80, good volume and tension. Temperature 99.2 to 100.4°.

2 P. M. Vomited; cerebration sluggish.

4 P. M. Complains of very severe pain in occiput. Morphia, ¼ grain subcutaneously. Afterward slept very well, respiration 20 to 23. At 8 P. M. temperature 102° and remains so until next A. M.

January 5. Temperature 99.4°. Pulse 78, feels well. Pupils equal, normal, no nystagmus, resting quietly. Under primary ether, wound dressed at 2 P. M., dressing moist, no pus, some oozing of blood from the middle ear, and depth of the mastoid had foul cholesteatomatous odor. Dura and sinus wall in good condition, no change from when first exposed. Some necrosis of skin flap edges. Irrigated and packed with iodoform gauze. Patient was delirious during the

next hour, crying with pain in his head. Was given morphia ¼ grain, which was repeated at 7 P. M. Pulse 80 and temperature 101° at 9 p. m.

January 6, 12:30 P. M., rather restless; slightly delirious yet recognizing people. 9 A. M., could not be aroused. Under homatropin Dr. Bossidy reports optic neuritis in both eyes. From this time gradually failed; became cyanotic at 11 P. M., respiration 6 to 8 per minute; pulse very rapid; unaccountable; and at 11 P. M. *exitus lethalis.*

Without giving the findings of the Pathological Department in detail, the autopsy showed on the anterior outer surface of the right cerebellum an erosion of the brain or superficial abscess, intra-dural, of about 1 inch in diameter, ⅜ inch to ½ inch in depth. The sinuses made in the exploration by the trocar were not visible except the long one which went forward 2½ inches, which was shown as a fine red line with normal brain substance round it. The end of the puncture stopped ⅛ inch before reaching the abscess. It is probable, however, had the abscess been reached, on account of the large amount of brain destruction, and also of the fact that there was no pus under pressure to be removed, and also because the tract for its evacuation would have been so long that the discovery of the abscess would have made no difference in the condition of the patient.

In this case the abscess was probably latent for a long time, possibly for years. The infection doubtless made its way through the labyrinth.

Case 41. Bullet wound of the right ear, probably self-inflicted. Invasion of the mastoid. Delirium tremens. Removal of bullet. Radical operation, with skin graft. Recovery with a slight amount of hearing.

Michael B., thirty-three; married. Admitted October 20, 1903, to Aural Department. Patient well developed, large, strong and well nourished. Police officer. Was said to have been shot accidentally at station; while removing his trousers, his revolver fell from his pocket and was discharged. Taken to Relief Station. The region of the right ear was found much discolored by powder, with an ugly ragged wound leading directly inwards. An exploratory operation was made to remove the bullet, but it was not found. This was thirty-one days before admission to the Aural Department. Soon after he was removed to the main hospital, and later an unsuccessful explor-

atory operation was made to discover the bullet. The patient then went into alcoholic delirium, which lasted two or three weeks. The discharge from the right ear became purulent and very copious; treated by antiseptic irrigations and dressings.

Examination: Mentally unbalanced, affable, rather loquacious. Region of right ear swollen; auricle swollen and red, evidently dermatitis; considerable swelling and redness, with some edema over mastoid. Partial stenosis of external canal because of swelling of the skin. Pus very copious, and with a clear, serous fluid welling up from the canal; wounds of previous explorations firmly and neatly healed.

Examination by probe shows something rough in the external canal, which, on being removed with the forceps, is found to be a small piece of lead. The clear fluid was examined, but found not to be cerebro-spinal, but to contain a high per cent of albumin. Treated by hot irrigations and compresses to the ear. A few days later, probe found something rough in the canal, movable; and a much larger piece of lead removed with the forceps, the swelling of the canal being somewhat diminished.

October 27. Probe still finds something foreign in the depth of the canal. An incision was made from above and anterior to the insertion of the auricle, running backwards and down to the tip of the mastoid. The periosteum was elevated, extending into the canal till the middle ear was exposed; and there projecting from the bone was a small piece of oxidized lead; forceps showed it to be firmly imbedded. It was sticking out of the hard bone below the round window, above the jugular bulb, forward of the posterior canal wall enclosing the facial nerve, and just backward of the opening of the Eustachian tube. At its entrance it had evidently cracked the bone between the external canal and glenoid fossa, because soon afterwards movement of the jaw was painful, and there was swelling in this region. With fine chisels the very hard bone around this piece of lead was slowly dissected away, some of the posterior canal wall of necessity removed. On account of its close proximity to these vital points it was necessary to be exceedingly careful, and therefore the operation was prolonged; but it was very fortunate that the jugular bulb probably had an abnormaily low position, and the carotid canal probably was deep and farther forward than usual. However, after two and one-half hours, a piece of bullet which had mushroomed and

was five or six times larger at its inner end than at its presenting part, was extricated. Very slight amount of hemorrhage during the whole of the time of operation. The parts were curetted smooth and the cavity was packed. Up to this time there had been more or less delirium.

November 9. The middle ear has continued to discharge very copiously; canal narrowed; stretched open by tents of cotton wet with boracic acid and alcohol. No more delirium; patient quite rational.

November 25. Following hearing tests made by house officer; Weber, lat. to right. Watch, A. D. o. A. S. $\frac{50}{50}$

Schwabach A. D.	a.	0	5	0	0	0	A.S.	19	10	7	15	10
	b.	8	5	7	5	0		7	5	5	5	5
		C	C^{I}	C^{II}	C^{III}	C^{IV}		C	C^{I}	C^{II}	C^{III}	C^{IV}

Was allowed to leave the hospital for a couple of weeks for recuperation, etc., and was treated at the Out-Patient Department. The discharge from the canal and from the persistent mastoid sinus was copious. Re-admitted to hospital January 8. 1904.

January 9. Operation, middle ear, etc., full of granulations; old incision reopened and complete exenteration made, removal of attic contents and throwing all the cavities into one. The hole made by the bullet has filled with granulations; scraped out.

January 17. Thiersch grafts by skin from the leg, covering the whole of the inner cavity. Proper flaps made and posterior wound sutured.

March 7. Two stitches sloughed; discharge profuse from ear, cleansed and treated by the dry method.

March 10. Under cocaine, a couple of stitches put in. On 11th discharged from the hospital.

After this patient was treated occasionally at the Out-Patient Department. November 30 has the following notes:

The wound posteriorly healed. The inner surface of the cavity completely dermatized except for one small perforation which leads directly inward into the inner wall of the middle ear, evidently the cavity left by the bullet. This has been treated by curetting, caustics, astringents, etc., but probably persists because of slight caries of the walls. It, however, gives him no annoyance and can be kept comfortable by occasional treatment. The hearing is almost abolished. Cannot hear the voice in the right ear. At long intervals a little

buzzing or low whistle tinnitus in that ear; not annoying. Patient somewhat addicted to alcoholic stimulants, is a large eater, and well nourished as stated. Before July had a sudden dizzy fit; fell off a chair while at a game; he fell towards the right side, was unconscious so that did not know what happened. Vomited a great deal afterwards, "probably because of something the physician gave him." He got all over it and has not had a dizzy spell since. The attack was probably not of aural origin.

At this visit hearing tests were as follows: A. D. Rinné negative. Sound of very loud voice faintly heard.

Schwabach, A. D.	a	0	8	6	5	Galton's whistle high.
	b	8	6	7	10	
limit 2.7		C	C^{I}	C^{III}	C^{IV}	

Patient went on in this condition with occasional treatments till about the middle of March, 1905, when late one night his body was found at a patrol box, he probably having succeeded at this time in his attempt at suicide. This was denied by him after the first attempt, but the powder stains and the position of the wound show that the pistol must have exploded nearer than was alleged.

This case is reported as showing the extremely delicate position into which the bullet was driven, almost the only one in that region it could have reached without fatal consequences.

The writer wishes to express gratitude to Drs. H. J. Inglis and W. F. O'Reilly for valuable assistance; and especially to Dr. C. R. C. Borden, who compiled the South Department statistics and performed some of the operations in the contagious wards.

XXXIX.

OBSTRUCTION OF THE EUSTACHIAN TUBE A FACTOR IN POST-OPERATIVE MASTOID FISTULA AND IN CHRONIC SUPPURATION OF THE MIDDLE EAR.*

By Thomas Hubbard, M. D.,

TOLEDO.

My attention was called to the question of tympanic drainage in the course of observation on certain patients having permanent perforations of membrana tympani. The intermittent discharge was at first of catarrhal character and later muco-purulent or purulent. The cause of recurrence was either irritation or infection from the auditory canal with increase of fluid in the tympanum, or congestion of the Eustachian tube with consequent obstruction to normal tympanic drainage. With this conception of the important function of the tube in mind one cannot escape the conclusion that it should be carefully studied as a factor in all conditions of the middle ear and cells accessory thereto, in which drainage is diverted externally. In the cases above referred to, having perforate drum membrane with tubal obstruction, all that was necessary was to relieve Eustachian congestion, cleanse the external canal, protect the tympanum from irritation and normal drainage was re-established. In other words, it is the relation of the calibre and functional activity of the tube to the quantity and quality of fluid to be drained away which determines the direction of flow. To illustrate this point one of the cases will be briefly narrated:

A gentleman having a permanent perforation of more than ten years' duration sought relief from offensive discharge and constant pruritus and erythema of the skin of the canal. The routine treatment was used for several weeks, antiseptic cleansing of the canal, removal of small granulations, tympanic irrigation through a large perforation, catheterization and medication of an obstructed tube by bougies dipped in 10 to 15 per cent. nitrate of silver ointment. This was followed by

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

the adaptation of an artificial drum membrane—a rubber disc on silver wire—and discharge promptly ceased, having been diverted through the Eustachian tube. A year after the initial use of the rubber disc as an obturator he reported that his ear was in satisfactory condition, hearing improved, and there was no perceptible discharge even during an attack of coryza. This case is narrated not to enlarge the subject matter under discussion, but to illustrate the principle of treatment of aural fistulous discharges in general, including a certain class of fistulæ persisting after the operation for simple acute mastoiditis.

To be sure, the majority of fistulæ at the site of mastoid operation are due to incomplete operation; either a pyogenic cell having been overlooked, or antrum not thoroughly cleaned out, or diseased attic being the source of pus. Such as these usualy require a second operation. But there are cases in which a perfect operation is followed by a persistent mucus or muco-purulent discharge from a small fistulous tract in the depth of the excavation, and to this condition attention is directed. *The first step is a careful examination of the Eustachian tube.* An acute purulent mastoid inflammation of a few weeks' duration with constant flow of pus through the tube causes hypertrophy of normal lymphoid tissue in and around the tube and finally obstruction to drainage. Simple inflation by the Politzer method or even the catheter does not definitely determine the functional capacity of the tube. The use of the bougie is indicated for accurate diagnosis and treatment. The normal mucous secretion of tympanum and accessory cells left with intact secreting membrane will seek outlet by the channel of least resistance. The problem is to re-establish the normal function of the tube; to encourage active drainage—something more than merely an overflow of the tympanic contents.

In one case which I have in mind, in which a slight mucus flow from the wound persisted several months, a few applications of the bougie dipped in nitrate of silver ointment seemed to remove an obstruction and the fistula promptly healed. In this case there was probably granulation near the Eustachian orifice. Recovery would probably have taken place in time, but even a mucous fistula is more or less of an opprobrium in mastoid surgery, and rational treatment is urgent. The habit of diverted drainage should not be allowed, if pos-

sible to prevent, for it is not improbable that even Eustachian secretions, following the path of least resistance, may be permanently directed toward the fistulous tract, if tubal obstruction near the pharyngeal orifice prevent for any considerable time natural flow into the naso-pharynx.

The second division of the subject refers to *tubal obstruction as an indication for radical surgical operation in chronic suppurative conditions.* Whatever be the cause of the purulent discharge—more or less extensive areas of pyogenic membrane in poorly drained cells, or eroded membrane, ultimate success of treatment may depend upon the condition of the natural drainage canal, the Eustachian tube. The proposition is simply stated. If the tube be permanently closed, impervious to forcible inflation and impenetrable by prolonged application of the bougie, then the only way by which the external discharge can be stopped is by destruction of all secreting membrane, normal or pyogenic, and cicatrization and epidermization of the tympanum attic and mastoid cells.

I can state my position more clearly by an illustrative case. A lad of seventeen gave the history of having had a foul smelling ear discharge for twelve years. The symptoms for which he applied for relief were: constant discharge with odor, headache, occasional vertigo, lack of power of mental concentration interfering with his education, and impaired general health. Routine treatment, attic and tympanic irrigation, gave decided relief for a time. Persistent attempts to open the Eustachian tube failed. There was probably recent obliteration of the osseous portion, as he told me that for about four months he had not been able to blow air through by the Valsalva method, a practice which had formerly given him relief. Treatment was stopped for a month to see if improvement was permanent, and at the end of that period he requested the radical operation, as he had relapsed into the former condition. The radical operation was done and the result was perfect. All annoying symptoms disappeared and his general and mental condition are decidedly improved. In this case permanent occlusion of the tube was a factor in deciding against prolonged treatment and fortified the decision in favor of the radical operation. It was also a factor in the excellent result.

Conclusions: Obstruction of the Eustachian tube is a common sequence of acute purulent otitis media and purulent mastoiditis, and retards recovery.

It is a factor in causing chronic otorrhea, and post-operative mastoid fistulæ or delayed healing of mastoid.

Permanent occlusion gives one indication for the radical operation in chronic purulent otitis.

The condition of the tube should be determined prior to radical operation, and if permanently occluded in the osseous portion there is no necessity for deep curettment of the tympanic orifice.

DISCUSSION.

Dr. Edward B. Dench, of New York, said the occurrence of a post-aural fistula after mastoid operation as the result of permanent occlusion of the Eustachian tube was a possibility, but he thought it was rare. Personally, he had never seen it. In a certain number of cases these post-operative fistulæ persisted for some time, and the explanation offered by Dr. Hubbard for the chronic discharge might be the correct one. Almost invariably, however, the persistent suppurative process could be traced to the presence of a small piece of necrosed bone that had been left behind.

The speaker emphasized the absolute uselessness of depending on drainage through the Eustachian tube, and in any case where the otologist had to deal with a foul, persistent discharge resulting from the presence of dead bone, there was only one thing to do, and that was to remove the cause of the suppuration by surgical intervention.

Dr. Max A. Goldstein, of St. Louis, said that at the last Section Meeting he showed two cases where there was a distinct connection between the mastoid fistula and the Eustachian tube, so that by catheterization of the tube, and blowing air or vapor through the catheter, mucus from the Eustachian tube could be ejected through the mastoid fistula. In both of these instances the Eustachian tubes were perfectly free, and their contents were mucus in character—not mucopurulent.

XL.

CARCINOMA OF THE LARYNX.*

By S. E. Solly, M. D.,

COLORADO SPRINGS.

I present to you a report of a case of carcinoma of the larynx in which complete laryngectomy was performed. The patient died two months later. The direct cause of death was obscure, and is especially worthy of consideration.

L. F., aged 43 years, woman, married, white, native of Australia; occupation, laundress; residence, Nome, Alaska.

First Examination, September 10, 1904. History: Had always been healthy and unusually strong, active and temperate in her habits; no previous serious illness. Two years before began to get hoarse, till voice entirely disappeared. Three months ago dyspnea was first experienced, and it gradually increased. In consequence she gave up work and went to Tacoma, where she consulted Dr. Peleg Wing, who immediately sent her to me at Colorado Springs.

Present Condition: Marked dyspnea; general appearance healthy, well nourished; height 5 feet, 6 inches, weight 152 pounds. Before dyspnea began, weight had increased from her average normal weight of 145 pounds to 160 pounds.

Larynx: After spraying with adrenalin and cocain a good laryngoscopic image was obtained, showing a nodular tumor growing from the anterior wall of the larynx, and extending around two-thirds of its circumference. The upper surface of the growth was pushing up the false cords, so that they were tense and convex, but it did not extend above them. I removed a portion of the growth with a curette; it proved to be carcinoma. A curetting at the same time from the posterior wall showed normal membrane.

Sept. 5: The dyspnea became so serious that tracheotomy was done in an emergency by my colleague, Dr. Gildea.

Sept. 10: As Dr. W. W. Keen, of Philadelphia, happened fortunately to be in Colorado, I waited for him to perform a total laryngectomy. I had previously seen him do this operation. He very kindly operated the next day. His report is as follows:

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*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

Operation, Sept. 11, 1904: I rigged up extemporaneously a Trendelenberg apparatus for the administration of the chloroform by carrying a long rubber tube into the tracheotomy tube, and, in order to prevent kinking of it at the opening of the tracheotomy tube, I wound a spiral spring for about four inches around that end, but I soon had to discard it and administer the chloroform on some cotton and gauze held by a pair of forceps over the tracheotomy wound.

In order to get room enough, I first made an incision in the middle line from the tracheotomy opening to the top of the sternum. The trachea lay at a great depth. I next divided three rings below the tracheotomy tube. This enabled me to displace the tube downward sufficiently to work above it, though, as I have already said, I soon had to dispense with the tube entirely. When I took the tube out, I passed a silk suture through the skin and the margins of the tracheal wound and drew apart the two margins of the wound, passing the sutures through the skin of the two shoulders, so that I was able to dispense with retractors. She was then placed in the Trendelenberg position. I then proceeded to do a total laryngectomy in the manner devised by myself (*Annals of Surgery*, July, 1899). As the epiglottis was entirely free from disease, I left it in place. Only two vessels were tied. A light packing of iodoform gauze was placed in the upper part of the wound where it was shut off by suture from the pharyngeal cavity; this was to be removed the next day.

The day after the operation, her temperature by the vagina was 101.8 degrees, its highest point. By the fourth day it had fallen to the normal, and after that fluctuated between the normal and 101 degrees. Nutritive enemata were given for six days afterward. She was annoyed by a considerable amount of discharge from the wound, which, of course, was infected in consequence of the already existing suppuration. Food was taken by the mouth on Sept. 15, the fifth day. She sat up in bed on the second day and was out of bed on the fourth day. Wound healed entirely by October 25.

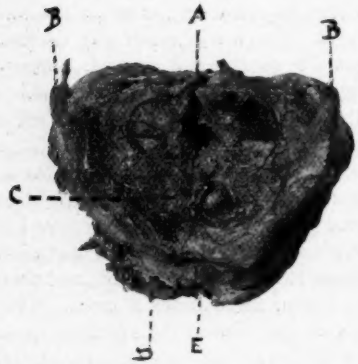
The specimen removed by operation consisted of the larynx, the first ring of the trachea—the epiglottis was not removed—portions of the right thyroid lobe and of the isthmus, with these a parathyroid gland and a normal lymph gland; also portions of both sterno-thyroid muscles. Microscopical examination of the growth showed carcinoma of the squamous type.

Section of the right margin of the isthmus of the thyroid revealed carcinomatous invasion; none in the lobes or muscles.

Convalescence: There was never any evidence of communication between the mouth and wound. Improvements in all particulars appeared to continue for several weeks. Three weeks after the operation, it was noticed that she was beginning to whisper intelligently.

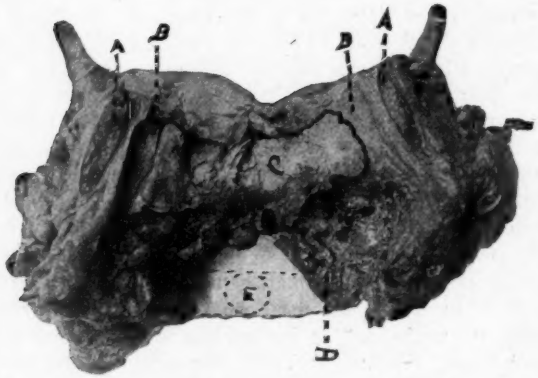
Relapse: About the middle of October there was some enlargement observed over the site of the right lobe of the thyroid. Dr. Keen telegraphed, urging removal of the portions of the thyroid gland not excised at the operation. The patient would not consent to a second operation, and therefore an X-ray treatment was given, three times a week. The treatment did not arrest the slow increase of the swelling, and dyspnea began to appear, though in a mild degree and slightly to increase. Upon November 6, two months after the operation, she received her last X-ray treatment, which she did somewhat reluctantly, as she thought it had lately caused her to breathe with more difficulty. She then walked up a flight of stairs to her room, but quickly began to walk up and down the room in an excited manner, exclaiming she could not get her breath. The house physician came almost immediately and found her sitting erect with very little movement of the chest and cyanosis coming on. The doctor could not then introduce the tube which the patient usually wore, but passed down a probe without encountering any obstruction. A little clotted blood in a watery secretion was ejected, and then her head fell forward and respiration ceased; the heart continued to beat for perhaps one or two minutes.

Post-Mortem, sixteen hours after death: A well developed and nourished woman at middle age. Tracheotomy opening in the neck. Incision above and below the tracheal opening healed, with the exception of a small granulating area immediately below in front. Tracheal opening smooth and admitting the tip of the little finger without difficulty. On the right side of the tracheal opening a hard mass was felt about the size of a pigeon's egg, and on the left a similar mass of smaller size. Connecting the two a bridge of infiltrated tissue could be felt passing immediately below the tracheal opening. Two glands about the size of almonds could be felt on the left side along the posterior border of the sterno-mastoid; the upper end of the trachea, esophagus, thyroid and adjacent

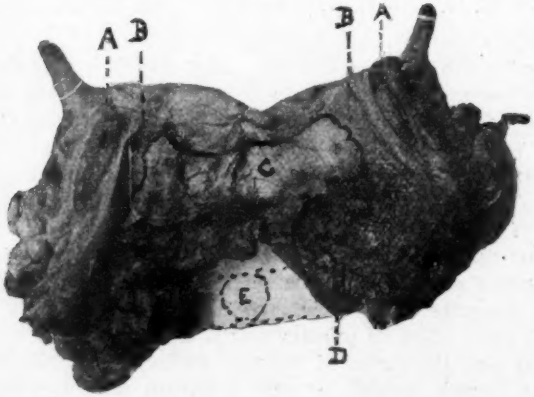


A—Uninvaded lumen of larynx.
B—Cornu of thyroid cartilage.
C—Carcinoma.
D—Thyroid (right tube).
E—Site of emergency tracheotomy.

A—Uninvaded lumen of larynx.
B—Cornu and thyroid cartilage.
C—Carcinoma.
D—Right tube of thyroid.
E—Site of emergency tracheotomy.



A—Cricoid cartilage.
B—Uninvaded lumen of larynx.
C—Carcinoma.
D—Right lobe thyroid.
E—Site of emergency tracheotomy.



A—Cricoid cartilage.
B—Uninvaded lumen of larynx.
C—Carcinoma.
D—Right lobe of thyroid.
E—Site of emergency tracheotomy.

muscle were removed en masse. The trachea showed no appreciable changes or stenosis, esophagus negative. The lateral masses noted appeared to be intimately connected with the lobes of the thyroid. Heart and vessels normal except a few small atheromatous patches in the arch of the aorta. Pleuræ normal; lungs crepitant throughout; cut surfaces showed everywhere a large amount of dark frothy fluid. Fibrous adhesions between omentum and cecum, peritoneum smooth; no fluid. Left kidney small, less than 2-3 the size of the right one. Capsules stripped with difficulty; other viscera no gross changes.

Microscopical Examination: Kidneys and liver showed passive congestion and many small hemorrhages. Sections were made from the tissue on either side and below the trachea, including the upper end of the trachea for a distance of two or three rings. Section from left side including the left lobe of the thyroid showed nothing beyond dense round celled infiltration. Lower section showed small carcinomatous area on anterior mucous surface of trachea. Tissue external to trachea showed granulation tissue and muscle infiltrated with carcinoma. Right section showed no changes in trachea except desquamation of epithelium and round celled infiltration. Right lobe of the thyroid infiltrated with carcinoma of squamous type.

This is a summary of the facts.

There was a brilliant and successful operation, and except for the natural hesitancy of the operator to remove the entire thyroid body, which macroscopically appeared normal, there would probably have been no recurrence of the disease. The original tumor evidently began, as they so frequently do, in the thyroid angle, and remained confined almost entirely to the area covering the inner surfaces of the thyroid cartilages, but unfortunately it must have infected, through the cartilage, the thyroid gland. That the disease began intrinsic to the larynx accounts for its slow growth in two years, since it is usually rapid when its primary seat is extrinsic.

What was the cause of death? Suffocation? No, there was no chronic stenosis or even sufficient temporary swelling of the tracheal mucous membranes.

Acute edema of the lungs? No, there was not time for that, moreover the character of the respiration and the post-mortem appearances did not bear out this opinion; although

the frothy liquid which exuded on section of the lungs 16 hours after death may suggest it, it was too slight in amount.

The cutting of the pneumogastric nerve in the operation could not account for it, for the symptoms did not come on for two months. Excision of the pneumogastric, Dr. Keen tells me, is only followed by temporary disturbances of respiration.

Could death have been caused by suspension of the functions of the parathyroid glands?

As I find physicians generally are not well informed about the anatomy and physiology of these bodies, I venture to briefly speak concerning them. There are four parathyroid glands in man. They are found adjacent to the thyroid gland, two on each side of the neck. While variable in size and position, are of an average measurement of 6-7 m.m. in length, 3-4 m.m. in breadth, and 1.5 to 2 m.m. in thickness, and are oval in shape. They are apt to be mistaken for the accessory nodules of thyroid tissue which are variable in size, number and position. The parathyroids, while they may be mixed in with these, or even be enclosed within the capsule of the thyroid, are different in their structure, in which they resemble the pituitary gland, and are moreover quite distinct in function.

Experiments upon animals have demonstrated that if the thyroid alone is removed, a cachexia results, which leads on to myxedena. On the other hand, if the parathyroids only are excised there ensue entirely different symptoms of which polypnea, that is rapid breathing, and tetany are the most evident. When they are both removed, the parathyroid symptoms are less, but there appears a clinical picture resembling a complete case of exophthalmic goitre.

When parathyroidectomy is alone performed the symptoms are less, according to the number of glands removed, also if the animal is previously and even subsequently fed upon a vegetable or milk diet.

In connection with this influence of diet, it is well to note that the symptoms are very slight in Aves and Rodentia, are increased but still slow in the Ungulata. In the Anthropoidea there is well-marked chronic cachexia; and in the Carnivora the symptoms take an intensely acute and rapidly fatal course.

Chiefly for these reasons, the theory has been advanced that the parathyroid secretion is essential to an animal's well-being

and that it antagonizes some toxin formed during the metabolism of nitrogenous food.

Might not it be a possible and even probable explanation of the cause of death of this patient, that first the removal of one parathyroid in the operation, and then the gradual destruction by the carcinoma of the remaining three, brought it about mainly in consequence of the effects of their obliteration upon the respiration.

With respect to the possible part played by the X-ray treatments, I would suggest that as one of the immediate effects of the exposure of the X-rays is to cause a local hyperemia, therefore an increased pressure was induced and so an added difficulty in the proper functionating of these glands. This might account for the patient feeling worse after the treatments, or again as it has been demonstrated that X-rays cause the deterioration of glandular tissue, they may have accelerated the destruction of the parathyroids.

DISCUSSION.

Dr. Chevalier Jackson said the case reported by Dr. Solly was an exceedingly interesting one, and had been skillfully managed. Professor Keen's technique for total laryngectomy was well known, and could not be much improved, excepting in regard to the Trendelenburg anesthetizing tube, which he would probably eventually abandon. All the chloroform that was required could be very easily given on a gauze sponge held in a haemostatic forceps.

Dr. Keen had abandoned preliminary tracheotomy, and Dr. Jackson said he thought it was entirely unnecessary to keep these patients breathing through a tracheotomy canula for a week prior to the operation. The tracheotomy, if one was necessary, could be done at the time of the operation, the only argument against this being the advantage of a preliminary union of the trachea to the neck integument.

It was a good idea to have these patients sit up as early as possible after the operation, as many of the resulting pulmonary complications were the result of keeping them in bed too long, especially if supine. Morphin and deep anesthesia were the other two causes of pneumonia.

The speaker said there was one feature of the treatment described in Dr. Solly's paper that he wished to criticise, and that was the giving of nutrient enemata. He regarded them

as a delusion and a snare, although it was sometimes necessary to give them to satisfy the family. He did not think they were of any value as a means of prolonging life. While the rectum was a good thing to drink out of, it was a poor thing to eat out of. Thirst could be quenched, but hunger could not be appeased. A stomach-tube was harmless, and enabled the placing of food where it could do some good. The odor of rejected alleged nutrient enemata made one hope that none had been absorbed.

Dr. Jackson said that in one of his cases of total laryngectomy he removed the involved pneumogastric nerve and the common carotid and jugular, and the patient apparently suffered no ill effects from it. About four months later the malignant process for which the operation had been done recurred in a gland on the opposite side of the neck; this increased in size until it pressed upon the pneumogastric nerve on that side, with resulting cadaveric paralysis, so that the patient could not expectorate, and he literally drowned in his own secretions. With each respiratory movement, the secretions bubbled up into the larynx, and then receded into the bronchi, until cyanosis and death occurred.

While he regarded Dr. Solly's ingenious parathyroid theory plausible, and probably correct, he would ask if any nerve involvement had been noted.

Dr. H. W. Loeb, of St. Louis, said that of five cases of laryngectomy that had been under his observation, the first three died of a recurrence of the disease. In one of these there was a partial laryngectomy followed by a total laryngectomy, and finally death. In the other two, recurrence and death took place within six months after the complete operation. The fourth case was that of a stone-mason who had been treated by another physician for supposed syphilis of the larynx. The case proved to be one of carcinoma, as demonstrated by the microscope, and the entire larynx was removed. The man made an uneventful recovery, and was still enjoying good health, working at his trade, fifteen months after the operation, without any signs of a recurrence.

In the fifth and last case the larynx was removed without a preliminary tracheotomy. For a week after the operation the patient was fed by means of the stomach-tube. On the seventh day, while sitting up in bed, he had a sudden gush of blood from the mouth, and died. At the post-mor-

tem the operative wound was found to be in excellent condition, and death proved to be due to a pulmonary embolism.

Dr. John F. Woodward, of Norfolk, Va., said that in 1899 he was consulted by a man 40 years old who complained of hoarseness. There was neither swelling nor tumor, nor other apparent cause for the hoarseness. About three months later, however, a swelling was noticed between the true and false cords on the left side. He was treated for a time, and his symptoms improved, but subsequently he complained of dyspnea, and there was a swelling over the entire inner portion of the left larynx. A swelling of the thyroid was also noticed at that time. He was lost sight of again, and when he reappeared, about six months later, he said that he had visited the Johns Hopkins Hospital, where he had been told that he had carcinoma of the larynx and thyroid. At first he refused operation, but finally returned and begged to have something done for him. With the assistance of Dr. Joseph White, of Richmond, Va., a tracheotomy was done under cocain with considerable difficulty, on account of the thickened tissues. The patient returned to his work as a railroad man, and remained comparatively well for about eighteen months. The pneumogastric nerve then showed evidence of involvement by pressure, and the patient died by being drowned in his own secretions, as in the case reported by Dr. Jackson. Dr. Woodward doubted the value of late operations in these cases, inasmuch as tracheotomy seemed to promise as much comfort and prolongation of life.

Dr. Wendell C. Phillips, of New York, said that in connection with the discussion of Dr. Solly's paper, the fact should not be lost sight of that those men who operated with comparative frequency for the removal of the larynx, either partial or complete, advocated a preliminary tracheotomy, and they did so for the reason that their final results were better, so far as the occurrence of septic pneumonia was concerned.

Dr. E. Fletcher Ingals, of Chicago, said we should not lose sight of the rule that laryngectomy should not be done in extrinsic cases; that is, when the disease had extended outward beyond the walls of the larynx, but in intrinsic cases the results were often very favorable. The speaker said he had in mind two such cases where the operation was done for him between two and three years ago. In both instances the laryngectomy was done by the Keen method; in one of them a

preliminary tracheotomy was done, and in the other it was not. Whether such a preliminary tracheotomy tended to prevent the onset of a septic pneumonia was doubtful. An interesting feature in connection with his cases was that both patients were able to enunciate very distinctly after the operation, although the trachea was stitched to the skin, and one of them had learned to talk so that he could be heard distinctly fifteen or twenty feet.

Dr. Solly, in closing, said that in the case he had reported, the condition was an intrinsic one, and very clearly defined.

In the case reported by Dr. Jackson, the patient's death was apparently due to pressure on the opposite pneumogastric, and this might have occurred in his own case, although no nerve elements were found in the tissues removed at the autopsy, and there were no evidences, during life, that the opposite pneumogastric was involved in the recurrent growth. The patient raised a little frothy secretion just prior to his death, and on section of the lungs, some frothy matter was found there. The post-mortem was very carefully made, and no thrombus nor embolus was discovered; neither were there any evidences of renal disease, although one of the kidneys was small.

XLI.

AN UNUSUAL CASE OF LARYNGEAL SYPHILIS REQUIRING TRACHEOTOMY.*

By Clement F. Theisen, M. D.,

ALBANY.

The following case, because of several rather unusual features, was considered worth putting on record:

Mrs. J., aged 38 years, married, consulted the writer for the relief of a gradually increasing difficulty in breathing. This she had noticed for nearly a year, and on any exertion, like walking up stairs, great dyspnea always came on.

There was, at the time the patient consulted the writer, a well marked respiratory stridor, and the inspiratory thrill, which is characteristic of laryngeal stenosis, could be felt when the fingers were placed over the region of the larynx. Her first husband contracted syphilis, and also developed a pulmonary tuberculosis, of which he died. The patient's family history, however, is negative in this respect, there having been no cases of tuberculosis so far as known.

The patient herself was inoculated with syphilis by her first husband some years ago, and received a thorough course of treatment. At that time there were well marked constitutional symptoms, with necrosis of the bone in several of her toes, necessitating some operative work. No symptoms of laryngeal obstruction developed until about a year before the writer was consulted, and since then, as before stated, there had been an increasing difficulty in breathing.

On examination, the nose and naso-pharynx, with the exception of a slight naso-pharyngeal catarrh, were found practically normal. Patient had a slight chronic pharyngitis. The tonsils were not enlarged. The uvula was slightly elongated and thickened, and was infiltrated for about one-half its length from the tip. This portion of the uvula was very hard to the touch. There was no ulceration, nor any evidence of former ulceration.

The entire epiglottis was infiltrated, its surface being perfectly smooth, however, and was also extremely firm to the touch.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

It was pulled back to such an extent that the laryngeal entrance was practically closed, and the only way a laryngeal examination could be made was by pulling up the epiglottis after cocainization. The epiglottis was also free from ulceration. This peculiar position of the epiglottis is probably due to old lateral syphilitic adhesions. There is considerable resistance when the epiglottis is pulled up in making a laryngeal examination. The aryepiglottic ligaments appear thickened and shortened.

On laryngeal examination, a most interesting state of affairs was found. The glottis, with the exception of a very small opening posteriorly, was closed by a mass of cicatricial tissue stretching from side to side, just under the vocal cords. This was found to be extremely dense and unyielding when examined with a probe. Practically no changes in any other part of the larynx could be seen. The movements of the arytenoids were somewhat impaired, the result probably of an old perichondritis.

A careful physical examination of the patient was made by an excellent general practitioner, who found her lungs normal. He found a right movable kidney and a digestive disorder, otherwise the patient was found to be in a fair general condition.

The sputum was examined several times with negative results. The patient was told that her laryngeal condition was serious, and consented to remain in the hospital for a time. A piece of infiltrated epiglottis was removed and sent to the Bender Laboratory for examination. The report stated that the piece removed showed simply a chronic inflammatory process. No tubercle bacilli were found in sections of the removed tissue.

Iodide of potash was administered, in order to see what effect it would have on the infiltrated uvula and epiglottis. The uvula became decidedly thinner and softer, but no change in the epiglottis could be determined.

The administration of the iodide, however, brought on a sudden attack of laryngeal edema, with greatly increased dypnea, and it was then promptly stopped. Preparations for performing tracheotomy were made, but the edema subsided so quickly, with proper local measures, that it was not required.

As the patient did not desire any further operations at this time, she was discharged from the hospital, but was kept

under constant observation. During the succeeding few months she got along fairly comfortably, when she did not exert herself in any way, but finally, when attacks of dyspnea became more frequent, she consented to a tracheotomy.

She was again admitted to the hospital and a low tracheotomy performed. A general anesthetic was not used on account of the great laryngeal obstruction, but the operation was performed with a solution consisting of equal parts of a 1-2 per cent cocain and a 1-10,000 adrenalin chlorid solution, making a solution of 1-4 per cent cocain, and 1-20,000 adrenalin.

In a discussion upon the fatal results of operations upon the nose and throat (in the Transactions of the American Laryngological Association for 1903), I called attention to the value of this solution in performing tracheotomies. It should be put up under aseptic precautions, preferably the day of the operation, and the bottle kept under a 1-1,000 solution of bichlorid, until the solution is drawn into a sterile hypodermic syringe after the patient's neck is prepared for the incision. It is only necessary to inject a few minims at different points along the line of incision. It is an ideal solution for tracheotomies in adults. I mean of course in cases in which the patient is in no immediate danger of death, so that the operator can take his time.

The use of a general anesthetic in cases where there is some form of laryngeal obstruction,—and that is usually the condition for which a tracheotomy is performed,—is not safe.

In emergency cases, where the patient is in imminent danger of death, the operator would of course not lose time in using any anesthetic at all, either general or local, nor could a local anesthetic of this kind be used, in performing tracheotomies upon children or very nervous adults. It should only be used in selected cases. The addition of even such a weak solution of adrenalin chlorid to the cocain solution, has distinct advantages, as it assists in preventing the possible unfavorable effects of the hypodermic injection of cocain.

The writer's patient complained of very little pain during the operation, and it certainly adds very materially to the comfort of the operator, if he is able to take his time in performing a tracheotomy.

The further history of this case is of no great interest perhaps, except that the gain in the patient's general condition has been quite remarkable.

At the time of the operation she was much reduced, and since then she has gained over thirty pounds in weight She is still wearing the tracheotomy tube, and will probably continue to do so for some time. She has been told that a radical operation, consisting of a thyrotomy, with a careful removal of the cicatricial tissue, followed by intubation, might relieve the breathing to such an extent that she would be able to permanently discard the tube. Up to the present time, however, I have not been able to get her consent, as she is so well satisfied with her condition. There is no way of dilating this stricture from above, as the cicatricial tissue is so absolutely unyielding.

The question as to just what to do in such severe cases is an interesting one. We must always be prepared to perform tracheotomy, and must bear in mind a statement of Simpson's, "That all cases of laryngeal or tracheal stenosis, however gradual, may at any moment take on a sudden exacerbation." The proper method of getting rid of the laryngeal stenosis after tracheotomy is of great importance.

J. Payson Clark has reported an interesting case of probable syphilitic stenosis of the larynx, in a young adult, on whom a tracheotomy had been performed for increasing dyspnea. Dr. Clark was unable to pass intubation tubes, so while the patient was under ether, the tracheotomy tube was removed, and gradually larger sizes of female urethral sounds were passed through the tracheal opening and up into the larynx. A pair of long, narrow, slightly curved forceps was then passed up through the tracheal opening and through the glottis The intubation tube was put on the forceps, which was then pulled back through the tracheal opening until the intubation tube was properly adjusted. The patient, however, unfortunately coughed out the tube, and as he would not consent to have it reinserted the tracheotomy tube had to be put back, when he left the hospital. This method would probably not be applicable to cases of syphilitic stenosis, in which, as in the writer's case, the cicatricial tissue practically occludes the glottis, and is so dense. The patency of the glottis would first have to be restored by removing this tissue by a laryngo-fissure, after which this method would undoubtedly be very useful.

In cases of simple syphilitic stenosis of the larynx, caused by infiltration and thickening of the cords and ventricular bands, or perichondritis with edema of the mucous membrane,

intubation with gradually larger tubes, preceded in all severe cases by a tracheotomy, is, I believe, the best treatment.

The writer has had several cases of this sort, in one of which the stenosis was in the trachea, well below the glottis, and could be finally dilated with Schrötter's tubes.

A preliminary tracheotomy in severe cases of syphilitic stenosis of the larynx should be performed perhaps in the majority of the cases. Then the operator can work from above, without the danger of an attack of sudden edema, and asphyxiation of the patient.

There are many cases of syphilitic stenosis of the larynx on record, in which tracheotomies had to be performed for increasing or sudden alarming dyspnea. I will not take your time in considering them in detail.

Such cases have been reported by Jeanne[6], Leonard[7], Navratil[9], Descos[16], Stein[10], Hall[19], Clark[2], Woods[18], Spencer[8] and in the cases reported by these authors, the stenosis was caused by infiltration and thickening of the vocal cords, and ventricular bands, and not by cicatricial tissue stretching between the cords.

In a fairly careful search of the literature of the past ten years, not many cases were found in which the stenosis was produced by cicatricial tissue occluding the glottis by uniting the cords or extending across the trachea.

Cases of this kind have been reported by Bleyer[17], Moritz[21], Collinet[13], Echtermeyer[14], Heymann[5] and Hubbard[12]. In Hubbard's case the diagnosis of syphilis was not absolutely positive. I was only able to find a few reports of cases in which the peculiar position of the epiglottis, closing the laryngeal entrance, was present.

Navratil[15] and Zwillinger[11] have reported such cases.

Bleyer[17] has reported eight cases of syphilitic stenosis of the larynx caused by a web formation. They were operated on by his combined method of tubage and the knife. He first cut through the membranous formation with Lenox Browne's sharp dilator, and then quickly dilated with intubation tubes.

In Hall's case of syphilitic stenosis, a tracheotomy had to be performed, and the patient died after coughing out the tube.

In Moritz' case there were adhesions uniting the cords, in a young woman, aged 24 years. A tracheotomy was performed.

Collinet has reported a case of syphilitic stenosis of the larynx, in which cicatricial tissue took the place of the cords and ventricular bands.

In Echtermeyer's case there was a membrane uniting the cords and almost closing the glottis. A tracheotomy was performed, after which the membrane was removed, and intubation practiced until the patency of the larynx was restored.

In a case reported by Spencer, the stenosis was caused by the presence of firm irregular masses of tissue, which covered the vocal cords and ventricular bands. This was removed by thyrotomy.

In Descos' case a tracheotomy was performed for extreme dyspnea, and later a laryngo-fissure was made, and the soft parts of the larynx resected. There were no adhesions in this case.

Navratil[15] has reported two cases, in which tracheotomy had to be performed for laryngeal stenosis caused by syphilis.

Heymann[5] has reported a number of cases in which membranous adhesions existed in the larynx. He does not give the exact number of cases.

In a case recorded by Sargnon[4] daily intubation had to be performed before the stricture was permanently dilated.

Navratil[15] and Zwillinger[11] have reported cases in which the epiglottis was pulled back (as in the writer's case) to such an extent that the laryngeal entrance was closed.

In Zwillinger's case, there were adhesions between the epiglottis and aryepiglottic folds. In Hubbard's case[12] a thyrotomy was performed and the membrane uniting the cords removed.

CONCLUSIONS.

a. Intubation is particularly useful in the cases in which the stenosis is not extreme, and when it is caused by a thickening and infiltration of the cords and ventricular bands, thus narrowing the glottis.

In some such cases intubation may be carefully used perhaps without preliminary tracheotomy.

b. When the stenosis is extreme, or when membranous adhesions exist between the cords, leaving only a very small opening, a tracheotomy should precede attempts to dilate the stricture from above. It is in such cases that a sudden edema may be fatal before an intubation tube can be properly adjusted.

c. Tracheotomy, followed by laryngo-fissure offers the best chances of a permanent cure when there is much cicatricial tissue occluding the glottis by uniting the cords.

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XLII.

A CASE OF INFECTIVE THROMBOSIS OF THE SIGMOID AND LATERAL SINUSES AFTER ACUTE MASTOIDITIS. DEATH FROM MENINGITIS. AUTOPSY REPORT.*

By Arnold Knapp, M. D.

NEW YORK.

In no intracranial complication of purulent otitis has greater advance been made than in sinus thrombosis, both in comprehension of the morbid process and in operative extension of the treatment. Notwithstanding, the following is a report of a case unsuccessfully operated upon, in a measure due to errors in judgment on the operator's part. As the report is a complete one and mistakes if properly interpreted are always instructive justification for its publication is given.

J. A.; male; aged twenty-four; Italian; was admitted to the New York Ophthalmic and Aural Institute on January 26, 1905.

Present Illness: About three weeks ago, after exposure to cold, the patient felt pain in his left ear. A paracentesis was performed, discharge followed and patient returned to work. Yesterday and today he has felt quite ill, and has had chills.

Condition on Admission: A well-nourished young man; flushed face; anxious expression; excited. The region of the left mastoid is very tender. The tenderness extends downwards and backwards where the pain is apparently most severe. The head is held in a constrained position. There is moderate discharge from the left ear. Mt. bulging. Anterior perforation. Canal normal. T. 104.6°. P 120. Eye-grounds normal.

Diagnosis: The painful swelling posterior and inferior to the mastoid with rigidity of the neck point to an infectious process in the posterior cerebral fossa. This taken in con-

*Presented before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

junction with high fever and the history of chills makes the diagnosis very probable of a perisinuous abscess complicating an acute mastoiditis.

Operation January 26, 5 p. m. Ether. To the usual incision, one extending directly backwards from the center is added. The periosteum is easily detached, as it is unusually loose. The cortex is dry. On removal of the cortex over antrum serous fluid exudes. The same fluid is contained in all of the mastoid cells. The mucous membrane in these cells is greenish and detached from the underlying bone. Free hemorrhage from the mastoid emissary vein. The sigmoid sulcus is distinct and seems transparent in places. On making an opening through this bone thin fluid pus appears, which was collected between the sinus wall and the bony sulcus. The mastoid process showed a pneumatic structure with well developed tip and zygomatic cells. These were completely removed. The antrum was small. There were some granulations in the aditus. External semi-circular canal was exposed. The dura above this unavoidably laid bare. The bone over the sinus was then removed. The sinus wall for one inch in length was discolored and mottled, but without any granulations whatever. Exposure of the sinus was continued in both directions until healthy parts were reached. The sinus was soft and compressible.

The microscopic examination of the pus revealed diplococci in capsules.

Subsequent Course: On the following day the patient was restless, complained of pain in the wound; the temperature remained at 104°, pulse at 90. The temperature then came down gradually, and from the third day on it was nearly normal.

February 2. First dressing. The sinus appears to be covered with healthy granulations.

February 4. The patient complains of headache, and feels chilly. His temperature shot up to 104°. On the following day the wound was dressed. There is some swelling of the soft parts in the digastric fossa. On the following two days the fever continues, but is less. He still complains of headache and seems peevish. On the 7th the temperature was normal. On the 8th and 9th the temperature gradually rose to 103° with a chill. The region below the mastoid is swollen. There is some tenderness posteriorly and inferiorly. He com-

plains of headache, does not take his nourishment well and seems to be failing physically.

Operation February 10: The wound is covered with flabby granulations. After these are scraped away the sinus is bare and protrudes like a solid sausage-shaped mass. The bone is removed along the course of the sinus posteriorly and down towards the bulb. The sinus is then incised. It is firmly clotted with a thickened outer wall. The outer wall is excised and a fairly healthy looking clot removed. In the center it is white and soft. A curette passed into the region of the bulb removes an apparently healthy clot from the dome of the bulb, but hemorrhage is not obtained. Passing backwards a clot is seen in the superior petrosal vein and at about a distance of one inch posterior to this, free hemorrhage takes place and the current is re-established.

The eyes show some swelling of the disc. In the evening the temperature was 104°; pulse 120.

On the following day he was very much better. He took his nourishment, but in the evening, after two chills in an interval of half an hour, the temperature rose to 105.6°; pulse 92. The region in the neck below the bulb shows absolutely no abnormality.

Operation February 12: The regular vein is exposed at the cricoid cartilage. It contains fluid blood. It is doubly ligated, divided, and the upper end dissected up as far as possible. A gland is removed. The upper end is left in the upper part of the neck wound. At 9 p. m. the temperature went up to 106.4°.

On the following day he complains of pain in the head, ear and throat. The respirations are more rapid and at 6 p. m. an infusion of 1½ liters of salt solution is made. In that evening the temperature rose to 108°. The eye-grounds are normal. Palpation about the wound and in the neck is negative.

Operation February 14: The sinus is followed back toward the torcular. An apparently healthy clot is removed and free bleeding occurs. The orifice of the superior petrosal sinus is curetted. From the region of the bulb very little can be obtained. The upper end of the jugular vein is slit open and a probe introduced to the base of the skull. The bulb is syringed with great care without evacuating clot or pus.

On the following days the patient is delirious with periods

of coma; great restlessness; general twitching; herpes labialis; right hemiplegia; involuntary passage of urine. Died on February 17, at 2 p. m., with symptoms of meningitis.

Autopsy February 17, 5 p. m.: A purulent exudate is present over the convexity of the brain, especially anteriorly, with considerable edema, fluid serum and enormously dilated veins. The superior longitudinal sinus is not thrombosed. Pus in the form of thick membranes is found in the posterior cranial fossa, especially about the anterior extremity of the right cerebellar lobe, on its superior surface and in the floor of the fossa. The dural surface of the lateral sinus shows no macroscopic lesion. On following the lateral sinus back, it is seen to contain pus and broken down clot with disease of the sinus wall directly anterior to the torcular. An unusually large set of veins given off from the left lateral sinus ramify over the tentorium. These veins are dilated and one is thrombosed. The other sinuses contain fluid blood. The left temporal bone is removed together with the jugular vein. The vein in its upper part contains a recent clot, its walls are somewhat discolored. The bulb contains a moderately disintegrated clot; the walls show no gross lesion. No extension from this area is visible.

Remarks: In this case the peculiar condition of the mastoid cells first of all attracts our attention. The cells and the antrum contained dark serous fluid not pus. The mucous membrane was greenish and separated from the underlying bone. This is evidence of severe infection which leads to necrosis without the formation of granulations. A distinct perisinuous abscess was present between the sigmoid groove and the sinus wall. The sinus wall was discolored and mottled without any evidence of the formation of granulations. It offered, in other words, no barrier to the absorption of infectious material which in this case produced the fever and the chills. As the sinus was compressible and soft it seemed justifiable not to open the sinus, but to await developments. On the following days the temperature came down and the symptoms seemed relieved until on the eighth day after the operation, namely, the day after the first dressing, there was some rise of temperature. During this period the thrombosis probably was developing from an affected sinus wall or a parietal thrombus. It was not until the eighth day after the operation when the temperature rose, and thus the first

symptoms of disintegration of the clot became manifest. As the patient's pulse remained perfectly normal the gravity of the condition was not recognized. It is the opinion of no less an authority than Grunert that the pulse-rate gives us the most important clue as to the intensity of the pyemic process. In the following days the temperature came down as is seen on the chart and the operation was delayed until on the ninth day, when with sudden rise of temperature and a chill the patient's marked depreciation of health became noticeable. The sinus was then exposed and a firm clot removed, which only in its center revealed any softening or discoloration. The region of the jugular bulb was curetted without producing any return flow of blood. The removal of the clot in an opposite direction was followed by an apparent re-establishment of the circulation. The cerebral side of the sinus showed no macroscopic changes. The pyemic manifestations were not checked, the temperature continued to show intense variations with chills, and two days later the jugular vein was ligated. The patient had never exhibited any symptoms either in the neck nor in the upper part of the jugular vein indicative of a bulb thrombosis. It seemed, however, inasmuch as free hemorhage had occurred from the torcular side of the sinus, that the source of infection must be located in the bulb. The normal jugular vein was ligated and the upper extremity followed up; an attempt to syringe out the bulb was made without evacuating any clots. The septic manifestations continued. The temperature rose to 108°. The jugular bulb seemed to show no active inflammatory signs, the continued source of infection had to be placed in the lateral sinus so this, at the third operation, was still further exposed and another disintegrated clot removed until the current was again re-established. On the following days the temperature showed no further variations, but remained betwen 102° and 103°, while symptoms of meningitis became manifest and patient died.

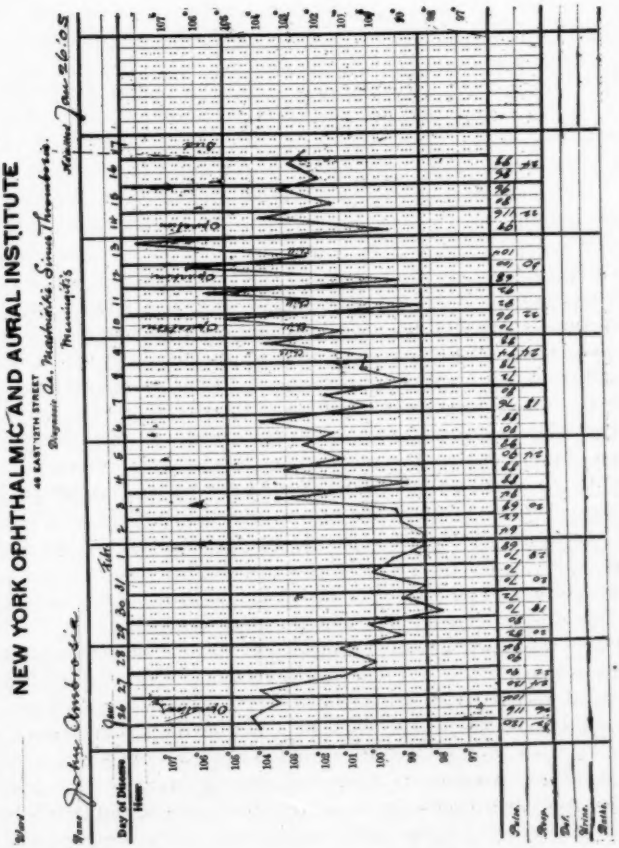
At autopsy a diffuse purulent meningitis was found. The cerebral side of the sigmoid and lateral sinuses showed no macroscopic lesion indicative of an extension of the purulent process. The sinuses contained fluid blood except the left lateral sinus, which in the unexposed area between the wound and the torcular showed a disintegrating clot and distinct disease of the internal sinus wall. One of a group of veins

ramifying in the tentorium was thrombosed. The bulb was carefully examined and was found to contain a slightly disintegrated clot without advanced signs of disease in the walls.

It seems to me that this case is instructive from the following points: The first is the confirmation of Leutert's assertion that a rise of temperature persisting for more than a day or two in the usually afebrile course of an aural suppuration is always connected with disease of the sinus if we can exclude a superficial infection, pus retention in the tympanum or purulent meningitis, and we unquestionably erred gravely in not opening the sinus sooner than we did.

Second, the macroscopic appearance of a clot does not always indicate its harmlessness. Though it seems hardly proper to consider every clot as septic, for we must remember that the formation of a thrombus is a natural process to protect the body from infection by way of the blood vessels, still by so doing possibly less errors of omission would be committed.

As to the value of the so-called re-establishment of the circulation. It is generally stated that in dealing with a thrombosis the thrombus has to be removed with the curette until the return flow of blood is re-established. This may remove all of the infectious material in many cases, at the same time it does not necessarily cure a parietal thrombus or localized disease of the sinus wall, and arrest the pyemic process. In the above described case, notwithstanding the re-establishment of the circulation at two operations, infectious clots reformed from a diseased sinus wall in the unopened part of the sinus near the torcular, as was shown at autopsy. It would seem to me much safer in cases of unquestionable infective thrombosis in the lateral sinus, to expose this sinus to the torcular, then shut off the circulation at that point by firm pressure and to excise the entire external wall of the sinus. Any remaining disease of the inner sinus wall can then be most readily observed and treated, additional infectious clots cannot form, and on the other hand the danger of a meningeal extension is diminished.


NEW YORK OPHTHALMIC AND AURAL INSTITUTE
Name
Day of Disease
Pulse
Resp.
Bowel
Urine
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SYMPOSIUM.

Intracranial Complications of Middle Ear Suppuration.*

XLIII.

MENINGITIS: ITS SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT, WITH REPORT OF A CASE.

By S. MacCuen Smith, M. D.,

PHILDELPHIA.

The clinical picture of meningitis was well known to the physicians of antiquity, but owing to a lack of anatomic study, it could not well be differentiated from other diseases of the brain. These studies were begun and completed in the middle of the eighteenth and, in the main, at the beginning of the nineteenth century. Robert Whytt, of Edinburgh, in 1768, was probably the first to clearly differentiate the clinical picture, and he described a number of cases in children of acute diseases of the meninges which coincided quite accurately with our knowledge of tuberculous meningitis. By succeeding study, particularly on the part of the French and German investigators, the pathologic anatomy and symptomatology were developed to the point at which we find them today. In comparatively recent times attention has been chiefly directed to the bacteriologic origin of the disease. The tubercle bacillus, after its discovery by Koch, was readily proven to be the pathologic agent of tuberculous meningitis, and quite a number of other micro-organisms were found in meningeal exudates and the cerebro-spinal fluid. Among these, the diplococcus intracellularis meningitidis and the pneumococcus play the most important roles. The diagnosis of the affection has been greatly facilitated by Quincke's ingenious invention of lumbar puncture. The method has not only been of value in diagnosis, but in the treatment of the condition as well.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

Clinically we distinguish between epidemic, suppurative, tuberculous and serous meningitis. Meningitis from aural disease differs from that due to other causes chiefly in that the symptoms are more severe and may be relieved by operation. Jansen states that pachymeningitis externa purulenta is the most common variety. It occurs twice as frequently with chronic diseases of the tympanum, as it does with the acute form. In this variety of meningitis a large proportion of the cases are insidious and without symptoms aside from those of the ear, and therefore, are not discovered until after operation; but on the other hand, they may begin with a chill and fever. Localizing symptoms are rare. Extension to the meninges may take place in one of three ways: (1) through carious openings in the skull; (2) through the natural communications, viz., the cochlea and semicircular canals, and (3) the infection may travel along the blood vessels and connective tissue. The cerebrum is affected when extension occurs through the roof of the tympanum; the cerebellum when it travels through the inner wall of the labyrinth. The most common mode of infection is either through the inner wall of the mastoid or through the roof of the antrum or tympanum. Jansen states that chronic aural disease affects the posterior fossa twice as often as the middle, and that acute aural suppurations affect the posterior fossa almost exclusively.

Leptomeningitis often occurs with sinus phlebitis, brain abscess or pachymeningitis, but is usually complicated only by encephalitis. This latter occurs in two forms: (1) the apoplectiform, which is fatal in from a few hours to three days, and (2) the insidious form, lasting from two to three weeks. Diagnosis of the latter is very difficult until serious disturbances of the sensorium have presented themselves. According to Macewen, leptomeningitis may occur without any visible tract along which the inflammation has traveled. In these cases the infection has been carried by the vascular system. Acute processes less frequently extend into the interior of the skull because the mucous membrane of the tympanum remains intact, but when this complication does occur it is due to the fact that the process has been sufficiently acute to cause thrombosis of the vessels.

Macewen further gives the mode of extension from the tympanum in chronic cases as follows: caries of the tympanic cavity does not usually affect the bone equally on each side,

but extends in certain directions. When the roof is attacked by the ulcerative process, a perforation is likely into the middle fossa of the skull. This osseous ulceration may go on for some time and perforation occur only after some injury has been received upon the skull in that region. Suppurative leptomeningitis of the basal ganglia and cerebellum may occur from extension along the sheaths of the facial and auditory nerves. The cochlea and semicircular canals, being surrounded by harder bone, are seldom attacked, although they may be in the tuberculous variety and following this a tuberculous meningitis may be set up. Osseous ulceration may occur either in the carotid canal or in the roof of the jugular fossa. The most frequent points of perforation are the tegmen over the tympanum or antrum and the sigmoid groove. When the dura is exposed by these perforations it throws out granulations to protect itself and assist in the absorption of disintegrated bone. This granulation tissue, when seen through the external auditory canal, may be mistaken for an aural polyp and removed with a snare, thus setting up an irritation which will produce a meningitis.

Meningitis serosa is a form of meningitis which can be distinguished from other varieties only after it has suddenly cleared up, either spontaneously or following operation.

Barker expresses himself as being of the opinion that hardly one-tenth of the intracranial complications of aural disease are brain abscesses and that more than nine-tenths are made up of meningitis, septic phlebitis and pyemia.

Meningitis manifests itself in a protean manner. Occasionally the symptoms are so typical that it is impossible to mistake the affection, and, at other times, they develop in such a latent form that only with the greatest difficulty and by the most careful attention to the etiology can a tentative diagnosis be made. This explains why, at the autopsy, the serous membranes of the brain are so often found involved when such a condition had not even been suspected intra vitam; and, on the other hand, the membranes are found pale and glistening in some cases in which the most marked cerebral symptoms have accompanied the affection. Since the disease, as a rule, represents a diffuse affection of the surface of the brain, it produces general symptoms; and, as in the preponderance of cases, certain portions of the cortex are implicated, or the affection is propagated to the cerebral substance, focal symp-

toms also develop. The diagnosis, therefore, necessitates the proper appreciation of both of these groups of phenomena. The general symptoms which may precede or accompany the focal symptoms are headache, fever, vomiting, slow pulse, respiratory disturbances, jactitation, epileptiform convulsions, general hyperesthesia, delirium, involuntary discharge of urine and feces, and phenomena which are almost focal, such as tetany, grinding of the teeth, rigidity of the extremities and retraction of the muscles of the neck.

Headache is the most constant symptom. It is due to pressure upon the dura, to inflammatory edema of the brain substance, or to an accumulation of fluid in the ventricles. It is always decided, and while the patient is conscious his most persistent complaint is of excruciating and tormenting headache. Even when in a comatose condition we often note that the patient grasps his head with his hands. Only in exceptional cases is headache absent or even less intense.

Convulsions and muscular twitchings are prominent. The muscular twitchings may assume the form of epileptiform convulsions; delirium is common, and, particularly in children, a peculiar cry with which they sometimes start from their coma, is characteristic; it has been called the "hydrocephalic cry."

The pulse, especially at the onset of the disease, is slow and this is all the more significant when fever is present; in the later course of the affection the pulse becomes more frequent, irregular and smaller. The temperature fluctuates markedly, varying between 101° and 106° F. The respiration is early influenced; it is increased in frequency, sighing, and finally becomes intermittent and may assume the Cheyne-Stokes type. Vomiting is common and shows the peculiarity that it is most prone to occur when the patient assumes the upright posture; as a rule it is not accompanied by nausea and often, with quite persistent vomiting, the tongue is observed to be clean. Vertigo is also a frequent symptom. Occasionally there is inability to swallow. Contraction of the pupil is often very decided. The latter is probably a spastic myosis, due to an irritation of the cortical origin of the oculomotor nerves.

A symptom which is almost invariably present is painful contraction of the muscles of the neck. This often confirms the diagnosis and is produced by an irritation of the nerve

supply of the muscles of the neck and particularly the spinal accessory nerves. Phenomena belonging to the same category as the rigidity of the muscles of the neck are trismus, grinding of the teeth and spastic contraction of the abdominal muscles. The latter condition gives rise to the scaphoid retraction of the abdomen. Rigidity of the muscles, particularly of the extremities, and convulsions restricted to definite portions of the body are common symptoms. Hyperesthesia of the skin and muscles must be grouped with the most important diagnostic phenomena. This is particularly noticeable in the muscles of the neck and of the calves. The reflexes are at first increased, later decreased and may finally disappear altogether towards the end of the disease. The presence of Kernig's sign has, in recent years, been included among the symptoms of meningitis, although its value should not be overestimated, as it is sometimes absent in well-marked cases of meningitis and is occasionally found in other conditions. Trophic and vasomotor disturbances in the skin are sometimes met with, and among eruptions herpes is the most common.

Constipation is the rule; later in the course, involuntary evacuations occur. The urine is excreted in small quantities and sometimes contains albumin. Sugar has been demonstrated in a few cases, and by some authors a remarkable increase in the amount of phosphoric acid has been noted. Extreme emaciation, often very rapid, is common, and is probably due to the cerebral effect upon the processes of metabolism.

The focal symptoms relate to paralysis of the motor area; occasionally monoplegias and hemiplegias are observed. Motor aphasia is not infrequent. As soon as the meninges in the neighborhood of the optic nerve become implicated the clinical picture of optic neuritis develops.

The symptoms naturally vary according to the principal situation of the meningitic inflammation. The convex portion of the brain is generally affected by suppurative disease, while basilar meningitis is much more likely to be of a tuberculous nature. It must not be forgotten that the spinal meninges are in many cases involved with those of the cerebrum, so that symptoms referred to the spinal cord are superadded to those developing from the brain. Suppurative meningitis is most commonly produced by contiguity, by way of the lymph-

vessels or of the veins, and is due to caries of the petrous portion of the temporal bone and purulent inflammations of the middle ear. It may also be due to purulent catarrhal inflammations of the frontal sinus, operations upon the nose, the orbits, or in the aural cavity, to trauma, particularly fractures at the base of the skull, to wounds, to furuncles and to abscesses of the scalp.

The following * differential diagnosis between meningitis, brain abscess and sinus thrombosis, compiled mostly from Barr, is interesting in this connection:

As to the treatment, apart from employing general methods, such as the use of rest and the application of cold, very little can be accomplished. Surgical interference is naturally indicated in most cases of meningitis complicating aural disease. This procedure however is satisfactory only in a very small percentage of cases, chiefly from the fact that the serious nature of the ear disease is not recognized until the meningeal inflammation has become well established.

Some authorities claim that *all* cases of *infectious* meningitis terminate fatally. The writer's experience would not only seem to confirm this observation, but also to establish the belief that cases which recover after operation are those which have been termed "meningeal irritation" rather than cases of true infectious meningitis.

A recent addition to our therapeutic resources is the operation of lumbar puncture. According to Quincke, the inventor of this method, the operation is indicated in the following conditions:

1. In cerebral pressure, with threatening symptoms, where it is desirable to relieve the pressure.
2. In moderate, long-continued pressure.
3. In conditions in which increased pressure is assumed or suspected.
4. In cases in which it is desirable to examine the cerebrospinal fluid independent of the cerebral pressure and thus obtain an opinion as to the nature of the meningitis.
5. In cases in which the fluid is to be examined for diagnostic purposes (blood, toxins, agglutinins, etc.).
6. For the purpose of injecting fluids into the spinal canal as therapeutic agents.

In the treatment of meningitis, lumbar puncture is employed largely for the purpose of relieving pressure, and in some cases

*See tables, pages 50 and 51.

	MENINGITIS.	BRAIN ABSCESS.	SINUS THROMBOSIS.
PAIN.	Pain is an early, severe and persistent symptom. Generally frontal and extends towards the vault, although it may be localized and correspond to the affected area.	Onset marked by sharp, severe pain in ear, which extends over side of head and develops into excruciating head pains, increasing on pressure or percussion. It does not disappear as long as patient remains conscious.	Pain is produced in this condition by pressure or percussion over the posterior part of the mastoid. This may extend down the neck along the course of the jugular vein. Headache is generally present but it is not characteristic.
TEMPERATURE.	The fever in this condition does not attain a great height, nor is it characteristic.	Temperature is at first high, then drops to normal and so continues until abscess ruptures, which is followed by a rise.	Fever is very high, with great oscillations, ranging between 100-102° F. and 105-106° F.
PULSE.	The pulse is in the majority of cases very rapid, but if there is local pus formation it will become slow.	In early stages pulse is rapid, but after 2nd or 3rd day becomes very slow and again in the final stages increases greatly in rapidity.	Here the pulse is exceedingly rapid and as the condition continues it becomes very small and weak.
RESPIRATION.	The breathing is very short and rapid and takes on the Cheyne-Stokes variety.	Breathing here is very slow, deep and stertorus.	Respirations in this condition are not affected.
RIGIDITIES.	Rigidity of the muscles of the back of the neck and retraction of the head usually accompany meningitis. There may be convulsions with loss of consciousness to a greater or less degree.	May be local rigidity of certain groups of muscles in the extremities.	Rigidity is not, as a rule, present in uncomplicated cases.

CHILLS.	Sensations of chilliness and shivering are present, but not to a marked degree, although the onset may be shown by a distinct chill.	Rigors present to about same extent as in meningitis.	Chills in this condition are very severe and are frequently repeated and may be of one-half hour duraton. They are followed by profuse perspiration.
GASTRIC DISTURBANCES.	Vomiting is almost invariably present. It is of the cerebral type and does not depend upon the taking of food. The accompanying digestive symptoms are constipation, and anorexia.	Vomiting of same character, but more severe and persistent. Digestive disturbances are likewise sympathetic and abdomen may be retracted.	Vomiting in this condition is generally present in the early stages, but is not severe. The tongue is dry and heavily coated and there is severe diarrhoea. These symptoms somewhat simulate enteric fever except that headache is more severe.
OCULAR SYMPTOMS.	Optic neuritis is not uncommon, but cannot be depended upon as a symptom of value.	Almost invariably present. In early stages photophobia, later inequality of pupils with dilatation affected side. Neuritis common later stages. Very frequently lids do not close entirely and eyeballs roll upward.	No special ocular phenomena.
NERVOUS SYMPTOMS.	Dizziness may be present in the early stages. The patient is extremely restless and often lapses into an excited delirium.	Drowsiness and slowed cerebration. Dizziness is usually present, being especially marked in abscess of cerebellum.	Dizziness is not infrequently found. The intellect is not, as a rule, interfered with except in complicated cases.
COURSE.	It may end fatally in three or four days, or it may last for two or three months. The average case is probably about two weeks.	Abscesses usually continue for from 2 to 3 weeks, but may extend over longer period. Death comes on by coma unless in later stages it is complicated by meningitis.	This condition usually terminates in from two to three weeks, although the period may be much shorter. Death is usually due to pyemia or metastatic abscess of liver, lung, kidney or brain.

of non-infective meningitis, uremia, etc., actually startling results have been reported.

The writer's own experience leads him to believe that lumbar puncture is of value chiefly as a means of diagnosis. The cerebro-spinal fluid has a normal specific gravity of about 1.010 and contains little or no albumin. In meningitis the albumin is greatly increased, while in cerebral abscess it is only slightly increased. It is claimed that the presence of more than one per cent is pathognomonic of meningitis.

The history of one case which I desire to report is as follows:

A. S., female, white, aged 6 years. Three years ago the child had an attack of pneumonia, complicated by an acute suppurative otitis media involving both ears. The discharge ceased in about two weeks.

Six weeks previous to admission to the hospital the patient became peevish and irritable; complained of pain over the eyes, in the frontal region, and in the right ear. After three weeks of more or less severe pain, a spontaneous rupture of the right membrana tympani occurred, relieving the aural pain, which, however, exerted no favorable influence upon the suffering referable to the frontal and occipital regions. Prior to, or immeditely following the appearance of the suppuration, the attending physician noticed some tenderness and swelling over the mastoid region; this however, subsided within a day or two so completely as not to attract further attention.

Following irrigation, the discharge ceased at the end of one week. By this time the headache had become general, the pain being especially severe in the occipital region and the neck.

On admission the temperature was 103° F.; pulse, 120; respiration, 24. The child was drowsy, stupid, and not easily awakened. Examination of the right ear failed to disclose any discharge or other evidence of tympanic or mastoid disease except slight redness and bulging of the superior and posterior wall of the canal. Traction on the auricle or pressure over the mastoid failed to elicit any outcry or other evidence of pain. The patient rested quietly that night and during the ensuing day, but on the second night became restless and started up from time to time with a shrill scream, relapsing into stupor. This condition persisted for most of the second day, when the patient became more quiet, but developed marked rigidity of the muscles of the neck with strong retraction of

the head. Marked and almost continuous twitching of both arms and legs now became prominent symptoms, as well as involuntary evacuation of bladder and bowels.

In this condition the writer saw the patient and advised an immediate mastoid operation, his diagnosis of mastoid involvement being based on the history of the ear having previously discharged, more especially, however, upon the characteristic drooping of the superior and posterior wall of the canal. The cortex was somewhat harder and thicker than usually encountered in a child of her years; the tip was not involved. Neither pus nor other inflammatory debris was found until the antrum was reached. A small carious opening through the roof of the antrum exposed a moderately inflamed and pulsating dura. The radical operation was performed, but no evidence of further intracranial involvement was discovered. For two days following the operation the patient improved only in one respect, namely, the reduction of the temperature by two or more degrees. However, on the third day after operation the patient attained a gradual rise of temperature, starting at 103 degrees F., at two a. m., reaching 107 degrees F. and a fraction by eight p. m., when death relieved her suffering. The moribund condition of the patient was so far advanced that little or no anesthetic was required. The post-mortem findings would have been interesting, but unfortunately an autopsy was refused.

In conclusion, the writer would strongly urge on the part of the medical profession a more careful and better conception of the serious complications that frequently develop from diseases of the tympanic cavity that are regarded, from the symptoms presented, as simple in nature.

All suppurative processes of the organ of hearing should be considered a menace not only to the health but actually to the life of the individual thus afflicted. The importance of this doctrine is not in the least lessened from the fact that we see many cases of otorrhea that have persisted for years without having caused appreciable harm. The ultimate outcome of many such cases is too well known and appreciated to admit of any controversy. After all, the most reliable treatment for meningitis complicating aural disease, and other intracranial lesions from the same cause, is to promptly recognize and properly treat the initial ear disease.

XLIV.

SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT OF ENCEPHALITIS AND BRAIN ABSCESS.

By Frederick L. Jack, M. D.,

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The term encephalitis seems to have several distinct meaning. In the first place, there is the so-called polio-encephalitis, superior and inferior, in which the cranial nerve nuclei of the pons and medulla respectively are destroyed either suddenly (acute polio-encephalitis) or gradually (subacute and chronic polio-encephalitis). With this form allied to polio-myelitis or infantile paralysis, otologists have little to do.

In the second place there is the acute exudative encephalitis (hemorrhagic encephalitis) described by Dana[1] as following influenza, cerebro-spinal meningitis, typhoid and other infectious fevers. This apparently never results in suppuration.

Thirdly, and of special interest to otologists, comes the acute suppurative encephalitis, a term synonymous with cerebral abscess.

This form of encephalitis, an end result of the extension from the ear cavities of pyogenic micro-organisms either directly, or along the blood vessel, furnishes together with meningitis, a diffuse result of similar infection, the principal cause of fatal outcome in the cases with which we have to deal.

Dana states that abscess occurs oftenest between the ages of ten and thirty, and this corresponds with my experience. I have tabulated according to the age of onset, forty-three cases occurring at the Massachusetts Charitable Eye and Ear Infirmary, the Boston City Hospital and the Massachusetts General, and find that thirty-two cases occurred between ten and thirty, and eleven between thirty and sixty.

Prior to the appearance of Macewen's[2] treatise, the subject of suppurative infection of the meninges and brain, resulting from disease of the middle ear, had not received the system-

atic attention it deserved, though many cases had been reported and the subject of brain abscess had been by no means neglected in the literature. This is not surprising in view of the universally hopeless prognosis of these conditions, both with and without operation.

A new impetus to the study and a fresh incentive to operation were aroused in 1893 by the work of this author, whose elaborate presentation of the subject from the pathological, symptomological and operative point of view, placed it for the first time on its proper plane, whether regarded from the scientific or from the purely practical standpoint. The increasing interest in this subject as well as the improvement in prognosis appears from the statistics gathered by various writers. Up to 1889 von Bergmann[3] found only eight successful operations on brain abscess of otitic origin; up to 1894 Koerner[4] had collected only 55 cases of operation both successful and unsuccessful; in the following year he had increased this number to 92. In 1898 Marsch found reports of 60 successful operations upon temporal and 12 upon cerebellar abscess.

The prominent symptoms of brain abscess are headache and vomiting, with normal or subnormal temperature in uncomplicated cases, slow pulse, progessive mental deterioration, mental dullness passing into apathy and eventualy into coma, preceded or accompanied by convulsion. Pupillary changes, ocular paralysis and optic neuritis may appear, the latter less frequently than in tumor. Hemiplegia sometimes completes the picture, and generally denotes extension from the temporal lobe inwards upon the internal capsule.

The usual seat of abscess is in the tempero-sphenoidal lobe over the tegmen tympani, and in this direction the exploratory operation proceeds unless definite symptoms of cerebellar disturbance point to invasion of that organ. Such symptoms following ear disease demand prompt surgical interference. It is true that in rare instances a small abscess may be absorbed, or a large one near the surface may discharge spontaneously, but this chance is too remote to justify expectant treatment.

Trephining over the squamous portion of the temporal bone is not always necessary for the evacuation and complete discharge of the abscess and removal of all symptoms. This point is of practical interest in view of the following conclusion of Macewen[5] with regard to the operation through the tegmen tympani: "Such an opening into the cerebrum suffices

for temporary purposes, but though it always ought to be made in order to eradicate the source of the infection, it is not safe to trust to it alone, as in many cerebral abscesses there are sloughs of brain tissue which cannot be easily removed in this way, but require a larger opening in the skull for their evacuation."

The case which forms the basis of this opinion is sufficiently important to place on record.

J. W., newspaper reporter, married, 25 years old, of Boston, presented himself at the clinic of the Massachusetts Charitable Eye and Ear Infirmary July 31, 1901.

History: The left ear had troubled him for three years. There was a discharge last winter which ceased up to six months ago, when it reappeared. During the last six weeks he suffered with frontal headache, but there was no pain in the ear until two days before admission to the Infirmary, when he awoke from a sound sleep with a severe headache.

Examination showed a small amount of pus in the auditory canal. The walls of the canal were slightly swollen, but not especially tender to pressure. Landmarks of the drum membrane were obscured by swelling. The posterior segment of the drum was red and bulging. The mastoid was tender to touch over the tip and antrum, but not swollen.

The hearing tests were as follows: Watch not heard; the hearing for the voice was reduced about one-half. The tuning-fork by air conduction was only heard one-twelfth of the normal time (T. F. 512 V. S. A. C.=20 "heard 1"). Bone conduction was normal (B. C.=10 "heard 10"). Tuning-fork applied to the skull was heard louder in the affected ear (Weber F. 256 V. S. louder in the left ear). The test by Galton's whistle was normal. The low tuning-fork was not heard (V. S. 192).

Severe headache appeared in a few days. The mastoid tenderness, however, gradually disappeared and also the swelling in the canal. The temperature fell from 101° F. on August 1 and remained at 99° F. for several days. The pulse during this time varied between 60 and 70. On August 7, seven days after opening the drum, the patient had a chill and complained of intense frontal headache. The temperature quickly rose to 102° F., pulse 90.

Extradural Operation: Under ether the usual mastoid in-

cision was made and the periosteum was divided. A deep opening was necessary through sclerosed bone the entire distance. The antrum was found filled with pus. On enlarging the opening above, and posteriorly, softened bone with granulations and purulent matter were found. With chisel and curette the bone was removed from the middle fossa for over a distance of one inch in length, and a half-inch in breadth. The lateral sinus was also exposed about an inch. This was necessary in order to thoroughly remove all diseased parts.

The dura was normal in color and without bulging. The wall of the sinus showed nothing abnormal. The neck of the antrum was enlarged and the middle ear carefully curetted, removing the incus together with masses of cholesteatoma. The wound was irrigated with a bichloride solution (1 to 3,000) and sterile water and dressed in the usual way.

Bacteriological Report: Mixed infection.

For a few days after the operation the patient's symptoms improved. The temperature on the following morning was 100° F., the pulse 80. He complained, however, of severe headache (frontal). The ice bag afforded some relief.

August 16, at 4 a. m., on the eighth night after the operation, the patient was found pulling and pushing the bedclothes and could not be roused. The pupils were equal and contracted, but reacted to light. Temperature 98° F., pulse 102, thin and wiry. The temperature suddenly rose to 103° F., and the pulse fell to about 60. The patient was perfectly quiet and deeply comatosed for four hours before operating.

Intradural Operation: The wound was reopened upwards over the squamous bone and posteriorly for about two inches towards the occipital protuberance. The skin and periosteum were retracted so that the skull above the mastoid was fully exposed. With chisel and rongeur forceps, bone was removed so that a larger surface of the middle cranial fossa was exposed than at the previous operation.

There was bulging outwards of the dura most marked over the tegmen tympani. No opening could be found in the dura. A hypodermic needle was passed twice upwards into the brain before pus was drawn into the syringe. A narrow knife was then entered at a point over the tegmen and passed upwards about one inch into the brain. The opening was enlarged by forceps and over four ounces of foul pus and sloughing brain tissue were evacuated.

The abscess cavity was thoroughly irrigated with a solution of carbolic acid (1 to 40), then one of bichlorid (1 to 3000). After all necrotic material had been removed the dural wound was wicked with a small piece of iodoform gauze. The wound over the skull was partially closed by sutures, and the cavity of the mastoid covered with thin rubber sheeting packed with plain gauze and dressed.

August 17.—The temperature rapidly fell to 99° F. in twelve hours, and the pulse ranged between 60 and 70. The patient was quiet during the night and seemed rational at times. Answered when asked if he had any pain. The wound was dressed, and upon removing the wick about one-half ounce of fetid pus discharged from the abscess cavity in the brain. The cavity was washed out and dressed.

August 18.—The patient recognized his attendants this morning. Temperature 100° F., pulse 75. The wound was dressed daily, and every possible care taken of his general condition.

August 22.—During four days the patient had complained of headache (frontal). The temperature varied slightly between 98° and 99° F., pulse good. He had been less rational, and at times was roused with difficulty. The discharge of pus from the abscess cavity was becoming less in amount, and the brain was found somewhat bulging into the mastoid wound.

Examination of the Eyes: Pupils react normally to light. No hemianopsia. With homatropine the fundus of the right eye showed a slight swelling of the disc and tortuosity of veins, the left eye marked swelling of disc and tortuosity of veins There was paralysis of left abducens muscle (eye would not rotate outwards beyond the median line). The patient stated, however, that the left eye had always turned inwards. The movements of the right eye were normal. In a few days showed signs of aphasia, which persisted for some weeks. When shown an object he was unable to name it, although he repeated the name when told. He also recognized a relative whom he had not seen for four or five weeks, but could not call her by name.

August 23.—Symptoms of imperfect drainage appearing, blunt scissors were inserted into the cavity of the abscess, and upon enlarging the opening there was a discharge of about two ounces of very foul pus. The cavity was irrigated and a rub-

ber drainage tube was inserted in place of gauze. The aphasia continued the same.

Recovery was uninterrupted, and the patient was discharged practically well September 12.

Remarks: Should the brain have been explored for the abscess at the time of operating upon the mastoid? Against such a step were absence of bulging of the dura or congestion and no visible erosion of the dura after careful inspection, especially over the area of the tegmen tympani. It is true that Wallace[6] reports a similar case in which an abscess involving the greater part of the tempero-sphenoidal lobe failed to produce bulging of dura into the opening made by operation. It is perhaps, therefore, unsafe to regard this failure as an absolute contra-indication.

Up to the time of the operation all of the symptoms could be accounted for by the condition found, and it did not seem advisable to injure brain tissue. The abscess, however, undoubtedly existed at that time and was the cause of the headache.

This question was discussed at a recent meeting of the *Societé Francaise d'Otologie de Rhinologie et de Laryngologie* in 1897.[7] The prevailing opinion seemed in favor of delaying for a day or two after operating upon the extradural abscess. The suggestion was made, however, that the danger of infection through continuing the first operation into the brain might be obviated by applying the thermocautery to the spot through which the puncture was made.

The opinion of Macewen regarding the necessity of opening the squamous portion as well as opening through the tegmen tympani seems to be very generally shared. Review of available literature shows that the practice of trephining (or of opening by the chisel over the ear is practically, perhaps quite, universal, and it would be presumptuous to assume from this one case that the prevailing opinion was erroneous. That such an opening is not invariably necessary is certainly demonstrated.

A certain advantage is gained by avoiding the external opening, in that the danger of hernia is reduced to the minmum, though this consideration should not deter the operator if any question exists as to the complete evacuation of the contents of the abscess.

The opening through the tegmen sufficed not only for the

removal of a large amount of pus, but also of considerable sloughing brain tissue. That the evacuation and drainage were complete is shown by the perfect recovery.

The loss of brain substance resulting from sloughing of hernia of the brain seems not necessarily to impair the mental condition of the patient recovering from a brain abscess. Epileptic seizures at variable times after recovery have been noticed and reported. These attacks are undoubtedly due to pressure from cicatricial tissue. In one case under my observation the attack appeared six months after the operation, gradually growing less in severity and frequency.

Lumbar puncture is of undoubted diagnostic value in many cases. In my cases at the Infirmary, puncture made at the time of operation has shown an opaque, cloudy fluid, and this not only in cases of meningitis, but also in cases of sinus thrombosis. The same has been observed recently in cases of brain abscess; one reported by Grossman[8] of Berlin, and another a recent one of my own, of recovery after operation. This fact seems to indicate that finding of a cloudy fluid (*per se*) is not conclusive evidence of meningitis.

Micro-organisms may be primary or secondary considered in their causative relation. The diplococcus intracellularis of cerebo-spinal meningitis may be considered as primary, and is rarely seen by the otologist unless ear disease intervenes. The more common forms, streptococci, or mixed infection, are observed as secondary.

The abscess caused by ear suppuration, as has been already said, is almost invariably situated in the temporo-sphenoidal lobe from one-fourth inch to an inch within the substance of the brain, and directly over the roof of the middle ear, sometimes in the cerebellum from peri-sinusitis and rarely there is one in both regions.

The fatality is very great from failure in finding the abscess, from meningitis, secondary abscess, etc.

In the forty-three cases mentioned, a large percentage of the abscesses were situated in the temporo-sphenoidal lobe; the cerebellum was next in frequency, and rarely there was one in the frontal lobe. Of the whole number, all were operated upon, and there were seven complete recoveries.

Imperfect drainage seems often the cause of a fatal result, and in my experience gauze wicks are much less satisfactory than a rubber drainage tube. In the two cases of recovery mentioned the tube was used.

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XLV.

SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT OF SIGMOID SINUS THROMBOSIS.

By James F. McKernon, M. D.,

NEW YORK.

In speaking of the symptomatology of this disease I shall do so under three heads; first the symptomatology in the typical cases, second in the atypical, and third in those where the bulb and sinus are primarily involved without macroscopic disease of the mastoid process. As most of the cases coming under our observation are those secondary to a mastoid involvement, or developing after the mastoid operation has been done, there are certain definite symptoms present which are fairly constant, and without much delay enable us to recognize this condition.

Temperature: The symptom which I consider by far the most important is that of temperature. This depends upon the amount of septic material entering the general circulation, which if it be large, is immediately followed by a rise from normal to 104, 105, 106, or even higher, and is quickly followed by a remission to normal or below. There may be only one rise during a period of twenty-four hours, or several may take place, depending upon the rapidity with which the poison is entering the general circulation. If the patient is kept under observation for several days these exacerbations of temperature become more frequent, and the variations greater.

Chills: They are present in only a certain proportion of the cases seen. When present, they usually precede the rise in temperature, and are followed by profuse sweating. Many of the cases coming under our observation exhibit no definite chill. They merely complain of a slight chilly sensation, and oftentimes this is overlooked, unless the nurse in attendance is on her guard and watching for such a manifestation. In a post-operative mastoid case with numerous temperature

variations, these chilly sensations are quite as important as though a decided chill were present.

Pulse: In cases of thrombosis, where there is a sudden and high elevation of temperature, there is a corresponding rapidity of the pulse rate, ranging from 120 to 170 per minute. In those of a lower temperature range, the pulse is often between 100 and 120, and when complicated (as oftentimes is the case) by a collection of pus in the brain, it is very much slower.

Respiration: During the earlier stages of thrombosis the respirations are little affected, becoming only slightly increased during the high temperature ranges.

Pain: In most cases of thrombosis coming under our notice the degree of pain is greater than that present when only an ordinary mastoiditis exists, or than that following the average post-operative case. The pain is usually referred to the side of the head, and to the occipital region, and is very frequently localized in the region of the torcular. When pain is present in the neck, I think it is usually due to the infected chain of lymphatic glands in this region, rather than to any obstruction in the vein.

Nausea and Vomiting: These symptoms are usually present at some stage of the disease, in a greater or less degree. The vomiting usually takes place at first, following the drinking of some fluid, but later on may occur at any time independent of the ingestion of solids or fluids.

Intra-Ocular: In about one-third of the cases coming under our observation the eye symptoms have been present, in the remaining two-thirds the eyes are negative. When puffiness of the eyelid on the affected side is present, it sometimes is caused by extension of the clot to the cavernous sinus, and also by an interference with the return ophthalmic circulation.

Vertigo: I have observed its presence only when the meninges are involved.

Cerebration: This has been normal except in advanced cases. We were formerly told to look for cerebral manifestations and believed they should exist in the majority of cases. This has not been my experience, for while the patients are drowsy, yet they answer questions intelligently when aroused, but do not wish to be disturbed. This drowsiness increases, however, if the disease is allowed to go on unchecked, and later there are distinct evidences of impaired cerebation.

Local Symptoms: We occasionally find the presence of edema in the mastoid region, and edema over and around the exit of the emissary and occipital veins. The symptom described by Gerhardt, and to which has been given his name, namely, that when pressure is exerted over both the external jugular veins it will show a marked increase of blood passing through the vein of the unaffected side, I have never seen demonstrated. In a fair proportion of the adult cases there is a marked stiffness of the muscles of the neck on the affected side, and in several instances aside from this stiffness I have observed a marked rigidity present.

Constipation: In all the cases coming under my observation, this symptom was present, and while a very common one, it is one that I believe coincided with the earlier stages of the disease. In the later stages of the disease, or when there is an advanced general sepsis, diarrhea is frequently present.

General Symptoms: Among some of the general symptoms at the outset of the disease may be mentioned malaise, loss of appetite, a dry and heavily furred tongue and a foul breath. The face wears an anxious and pallid look, the skin is dry, and later presents a yellowish tinge, indicative of sepsis.

Physical Signs: One of the physical signs which we have been told to watch for has been a hard cord-like swelling in the neck, along the course of the internal jugular vein, and when such a sign was present it denoted a thrombus of the vein. While unquestionably such a physical sign does occur, in the experience of the writer, it is a very infrequent one, as I have never been able to demonstrate such a condition along the course of the vein, though I have tried to do so repeatedly prior to operation.

The Atypical Cases: These are cases invariably following a mastoid operation, and usually do well for a few days after the mastoid has been opened. Then the patient becomes restless, irritable and disinclined to take food. The tongue, which before was clean and free from any coating, becomes dry around the edges and presents a whitish, glazed appearance in the center. The pulse increases from 100 to 130 per minute, and there is a slow, gradual rise of temperature to 103, 104, 105, or even higher, remaining so for several days. In some of the cases it will not vary a degree in twenty-four to forty-eight hours, while in others there is a little more varia-

tion in the temperature, but there are no sudden drops and no sudden rises. The patients complain of headache, and occasionally of nausea, but very few reach the vomiting stage. They are unable to sleep for any considerable period of time, and if surgical measures be not instituted they later show all the signs of pyæmia. There is no chill or chilly sensation present. Cerebration is clear, the only evidence of any mental disturbance being an occasional irritability of temper.

In the third class of cases there is an acute purulent otitis present, with the usual symptoms found accompanying this condition, and the subsequent symptoms detailed are the result of a direct infection from the tympanic cavity to the blood current closely adjacent, namely, through the floor of the tympanum to the jugular bulb. The explanation of the possibility of this is quite clear if we bear in mind the fact that in a certain percentage of the skulls examined we find an unusually high dome, encroaching upon the middle ear cavity, or a dehissence may exist in this region. Under such conditions as these, it can readily be seen how an active purulent infection of the middle ear cavity can primarily affect the blood current without first having to travel its usual course through the venous structure of the mastoid bone, the course of infection being through the small communicating veins and lymphatics, or by a process of absorption directly through the thin wall of bone in this region. The symptom of greatest importance is an unusually rapid rise in temperature, from 99 or 100 to 104, 105, or even 106, and quite as sudden as the rise a fall to 97, 98, 99, or possibly 100. The temperature may remain low for several hours, and then quickly rise again to the points first mentioned, to be followed by a rapid remission, and this may go on indefinitely until the end. During the exacerbations of temperature the pulse rate is rapid, ranging from 120 to 170 per minute. There is no chill present. The only evidence of chill found in these patients is that if seen when the temperature begins to rise, they will be found to have cold hands and feet. They are exceedingly fretful and irritable, and later become drowsy. The eye signs are negative. If the temperature range is allowed to repeat itself for several days, the tongue becomes white and dry. During the temperature remissions these patients (and they are usually young children) feel remarkably well, will ask for food and wish to sit up and play with their toys. This is one of the

phases of the disease which the parents and uninitiated find hard to comprehend. They see such an apparent improvement in the little ones that they are misled as to the dangers existing, and often believe they are well on the road to recovery until the next temperature wave occurs. The respirations are only slightly increased.

Diagnosis: The first class of cases is easily recognized, our diagnosis being based upon the temperature changes, the presence of the chill or chilly sensation preceding the rise in temperature, and following an operation upon the mastoid. If most of the symptoms given in this class be present, it is, of course, a comparatively easy matter to make a diagnosis, but if several are absent the diagnosis can be made from those given above. In the cases where the sinus is operated upon at the same time that the mastoid operation is done, and we have no previous symptoms to guide us, we determine whether or not it is necessary to operate on the sinus at this time, by the physical signs which are found present when the mastoid is opened. They are briefly, the presence of a necrotic area of bone over and around the sinus, with usually an epidural collection of pus. The dura covering the sinus wall is either markedly thickened, and darkened in color, or it may present a lusterless appearance, darker at one point than another, and usually the lower end toward the bulb is white or grayish in color. The sinus in some cases is easily compressible, and does not fill readily when the pressure is removed.

Bacteriological examination of the discharge is of value only in that it gives us knowledge of the characteristic infection. Another valuable aid in diagnosis is the blood count, not so much for determining whether a leucocytosis is present, but to determine the polynuclear percentage; as for example, if we find a polynuclear count showing a percentage of over 80, no matter what the leucocyte count be, whether great or small, we are almost certain to find an infective process disturbing the patient's economy.

The diagnosis in the second class, after eliminating all other diseases, is made from the continuous high temperature, and the fact that the patient is not progressing as favorably as he should after an ordinary mastoid operation. A physical sign which I consider of the utmost importance in this class of cases is that when we inspect the wound we find every portion of it apparently doing well, and covered with gran-

ulations, except one point, and that point is the bone forming the sigmoid groove. We will find the bone in this region darker in color than when it was first exposed at the time of operation, and there will be no granulations found upon any part of it. In other words, we have a mastoid cavity showing every evidence of healing except the bone over the sigmoid groove. I have seen this condition persist following a simple mastoid operation for between two and three weeks, where the sinus was involved, or had become involved subsequent to operation. The polynuclear count is of the same value here as in cases of the first class, and should always be made, as a high polynuclear percentage is of the greatest help in determining whether an infective process exists.

In the third class the diagnosis is made almost entirely from the wide temperature range, closely following, as it does, an acute purulent otitis. Bacteriological examination of the discharge is of value only as above stated. The same is true of the blood count, but the utmost importance should be attached to the polynuclear percentage, for if we find it between 80 and 90 it is, I believe, a distinct evidence that our patient is suffering from a septic process. All other diseases being eliminated, the cause of our patient's condition must be referred primarily to the ear.

Treatment: The treatment in the first and second class of cases does not materially differ. Where a diagnosis of sigmoid sinus thrombosis has been made, I believe it is wiser, provided the patient's general condition will admit of its being done, to primarily expose, ligate and resect the internal jugular vein from a point below at the clavicle, to its exit from the skull. Should any of its tributaries be found involved, they should also be ligated and resected well beyond any point of macroscopic involvement. All diseased glands encountered during the resection of the vein should be removed. After this has been done the sinus should be exposed from above the bend down to the region of the bulb, the dura should be opened freely with a scalpel, and the contents of the sinus evacuated. Should we be unable to obtain a flow of blood from the distal end of the sinus, then there should be a still further exposure in this region, and we should proceed backward toward the torcular, or even as far as this channel, until we secure a free return flow of blood, for it we do not obtain a blood current in this region sufficiently free to show that all

obstruction has been removed, our patients subsequently do badly, either from an extension of the infective process to other blood channels, or an encephalitis develops one or two weeks later, caused by an extension from the infective process that we have left in this region. When we remove the clot in the region of the bulb, we will find that in almost every case where the vein has been removed as the first step in the operation, that the so-called return flow is quite as free here as we would expect to find it if we had the internal jugular vein carrying on its usual function, the blood coming, no doubt, from the inferior petrosal sinus. If, as occasionally occurs in this region, we are unable to obtain a return flow of blood, it means that the inferior petrosal sinus is thrombosed, and when such a condition confronts us, we should, provided the patient's general condition will allow it, expose the sinus and remove the obstruction, as otherwise we are courting danger by allowing an infective process to remain here which may at any time cause further trouble for our patient.

The wound in the neck should be flushed with a warm saline solution, a large cigarette drain inserted its entire length, and the soft parts closed by a continuous suture, to within a very short distance of its upper end, and either a wet saline or bichloride dressing applied. This dressing should be renewed at the end of forty-eight hours. At the first dressing the cigarette drain should be drawn out for about an inch and cut off. Subsequently the neck should be dressed once every twenty-four hours in this manner, and at each dressing the drain should be drawn out about the same distance and the end cut off as before, so that at the end of four or five days the entire drain has been removed and primary union is accomplished.

In the third class of cases, the patients being nearly all very young children, the ideal treatment would, of course, be the same as in our other cases, but here we must remember that these cases are caused by a primary infection of the blood current, and when operated upon early the percentage of recoveries is in favor of removing the clot without ligating the vein. For these little patients do not bear prolonged operations well, and it is a matter of much more difficulty to ligate and resect an internal jugular vein in a very young child than it is in an adult, for we have a neck to deal with that is short and chubby, and usually a number of enlarged

glands to encounter, and up to the present time my experience has been not to ligate in these cases, or if ligation becomes necessary to do it at a subsequent operation, where the work can be done rapidly, and not subject these little patients to the added risk of a prolonged operation. It must be said, however, that in this class of cases, where a so-called free hemorrhage is obtained from below, we can never be sure that all infective material has been removed, for, so far, it has been an absolute impossibility to pass a curette from above into the jugular bulb, and in all probability a large number of our cases operated upon without ligation of the vein, have some infective material left in this region, not, however, in such quantity that the system cannot care for it, for were this so these cases would all be fatal. I believe that in the average case of sinus and bulb involvement, it is wiser to ligate and resect the vein, if the patient's condition will admit of it. Certainly in the cases of infected sinus or bulb thrombosis I feel easier as far as the patient's safety is concerned, if this port of entry is obliterated.

In the cases operated upon without ligation of the vein, where they show a varying post-operative temperature curve, it means that there is still some infective material being displaced from time to time. The patients improve notwithstanding, because the major portion of the infective material has been removed, and the system thus strengthened is enabled successfully to care for that remaining.

In young children the time element is one that enters largely into a favorable prognosis, for the shorter the time that we keep our patients on the operating table the quicker will be their convalescence. I am convinced that our results would be better did we operate during the temperature remissions, rather than when the temperature is at its height, for if operation takes place while the temperature is low, certainly the system has more reactive power, there is less depression and a more rapid convalescence will surely follow.

A word about delaying operation in these cases. Eliminate, if possible, all other diseases, and if this is done, then we must return to the original focus of infection, and follow this up in order to determine the cause of our patient's condition.

XLVI.

PATHOLOGIC FINDINGS OF INTRA-CRANIAL COMPLICATIONS OF MIDDLE EAR DISEASES.

By Thos. J. Harris, M. D.

NEW YORK.

When our secretary honored me with an invitation to present a paper on "Pathologic Findings" in connection with this symposium of the intra-cranial complications of ear affections, I was somewhat at a loss how best to proceed in order to avoid a more or less text-book presentation of the subject. After some reflection it occurred to me that an analysis of a considerable number of such cases in the hands of our most experienced American operators might offer food for study and discussion. We do not fail to remember the many valuable contributions along the same line from our European confreres, and especially Koerner's and Macewen's classical works, and yet it seems to us that an independent consideration of the subject might not be without value. To this end we addressed a letter of inquiry to a number of men connected with our largest special hospitals, asking for the following data:

1. Total number of cases of intra-cranial diseases treated, divided as follows:
   (*a*) Sinus thrombosis.
   (*b*) Meningitis.
   (*c*) Encephalitis and brain abscesses.
2. Number of deaths and recoveries, including number of cases operated upon.
3. In how many cases was the pus from the ear examined bacteriologically with the results obtained.
4. Was lumbar puncture made, and if so with what results.
5. Situation and character of the lesion, as determined operatively or by post-mortem examination (meningitis, serous or purulent; thrombosis,—what sinus involved; abscess, single or multiple, where situated; character of pus of abscess when examined.
6. A brief abstract of each autopsy protokol.

7. Antecedent condition of the ear—whether otitis was acute or chronic; whether intra-cranial involvement followed a middle ear or mastoid operation.

8. Result of blood examination when made.

9. Mode of infection, where determined.

In most instances the lateness of the hour at which the letter was sent and the amount of work involved prevented compliance with our request. We desire, however, to publicly express our thanks to Dr. James F. McKernon for his prompt response, and for the statistics furnished by him from the records of the New York Eye and Ear Infirmary, representing, without doubt, the largest amount of such cases treated by any one institution in this country. This report must be, then, of necessity an incomplete one, and is to be viewed rather in the nature of a preliminary one only. It has to do chiefly with the records from the ear department of the Manhattan Eye, Ear and Throat Hospital, and some of the various points considered can be included under "Pathologic Findings," possibly only by the broadest construction of the term.

During the past ten years, 1895-1905, there have been treated in that institution 41,799 cases of ear disease. Of these, 32,486 suffered with disease of the middle ear, and 12,744 cases were of a suppurative nature, acute or chronic. Of these, 32,000 odd cases of middle ear disease, there are records, more or less complete, of 60 cases of intra-cranial disease, divided as follows:

(1) Sinus thrombosis 23
(2) Brain abscess 7
(3) Meningitis 30

I. SINUS THROMBOSIS.

Of the 23 cases, 14 died, 9 recovered.

The jugular vein was ligated in fifteen cases, not ligated in eight. Of the fifteen cases where the vein was ligated, six recovered, nine died, all but two from one to twelve hours subsequent to the sinus operation. Of those not ligated, three recovered and six died. It will be seen that in this small series of cases there was no great difference as far as recoveries are concerned, between those cases where ligation was practiced and those where it was not practiced.

In this connection it will be interesting to recall the statistics of Koerner. He has collected 308 cases, with 180 recoveries,

or 58 4-10%. The vein was not ligated in 132 cases, of which 77 recovered, or 58 3-10%. In 94 cases the vein was tied before the sinus was opened, with 56 recoveries, or 53%. In 68 cases the vein was tied after the opening of the sinus with 38 recoveries, or 55%.

While it is true that statistics may be very misleading and the particular conditions under which ligation or non-ligation were practiced in these cases are not stated, it is not without significance that in these cases collected from all sources there is virtually no difference in the results by the different methods of treatment.

Character of the Disease in the Middle Ear.

Acute suppuration existed in seven cases. Chronic suppuration in twelve cases. In one case an acute non-suppurative process alone existed. In three cases the condition of the ear is not stated. In other words, chronic disease was found present in almost twice as many cases as acute disease. This is in line with Hessler's statistics, who found that in 130 cases 99 had chronic middle ear suppuration and 31 acute. Koerner states that his experience is just the reverse. As regards the age, it is noticeable that in only one case was the patient more than 29 years.

Optic Neuritis.

Optic neuritis existed in three cases. This is quite at variance with Koerner's experience, who states that he has never met with a case of optic neuritis in an uncomplicated sinus thrombosis.

In the first of the three cases (case 21) an acute suppuration process had existed for three weeks. Six days after admission to the hospital the patient became stupid and the optic neuritis developed.

In the second case (case 3) the neuritis appeared on the day after admission to the hospital, and was followed by the operation on the next day.

In the third case (case 4) it appeared twelve days after the operation. This was a case of Dr. T. P. Berens, and was regarded by him as a manifestation of hysteria. The group of symptoms, unconsciousness, optic neuritis, vomiting, dilation of the pupil of the side affected and twitching of the left arm and leg, would point strongly, however, to a meningeal irritation. The case recovered.

Temperature: There was nothing particularly significant in

the temperature curves in the different cases. Usually the temperature was high. This, according to Koerner, would be indicative of the septic state, and is borne out by the fact that in ten cases the disease was of such an advanced type that upon admission into the hospital they were in a more or less unconscious state. This would clearly point to the fact that the significance of the symptoms of this dread complication of middle ear disease is not yet sufficiently known to the profession at large.

Chills: Chills were noted in only eight cases. Doubtless careful inquiry would have brought out the fact that the chilly sensations to which McKernon has called attention were present at some stage of the disease in all.

Dysphagia: In two cases difficulty in swallowing was a prominent symptom. A case of Beck is quoted by Koerner where there was paralysis in swallowing due to pressure on the glosso-pharyngeal nerve. This must, however, be a rare symptom.

Complications: Three cases were complicated by cerebellar abscess. Metastasis in the arm was noted in one case. In one a cyst of the liver, not regarded as septic, was found, and in one case an abscess in the pleural cavity. One case (case 4) that of Berens, just referred to, had a paralysis of the trochlea. This, as far as I can find, has never been encountered save in thrombus of the cavernous sinus, which was clearly not present here. It is diffcult to account for it. As was stated, the case recovered. Finally, death occurred twice upon the table. These fatalities ought to emphasize the importance of early operation as advanced by von Bergman many years ago. In scarcely one case can it be stated that the operation was performed at an early stage of the disease.

II. BRAIN ABSCESS.

Seven cases with seven deaths.

Situation: In tempero-sphenoidal lobe, six times.

In cerebellum, once.

In three cases there was an antecedent acute suppuration of the middle ear; in the remaining four the process was a chronic one.

This is at variance with Grunert's statistics, where in 91% of cases the abscess followed a chronic otorrhea.

Jansen found in 2,650 cases of acute middle ear suppuration,

brain abscess once, in 2,500 of chronic suppuration, six times. The increased proportion of acute cases in the Manhattan records is to be noted, viz.:

In 3,078 O. M. S. A., three cases.

In 8,722 O. M. S. C., four cases.

Or one in every 1,000 of acute suppuration as compared with one in 2,300 of chronic

The classical mastoid operation was primarily performed in six of the cases, to be followed later by an exploration of the brain on account of the symptoms which developed.

Symptoms: Of the symptoms which were chiefly complained of, pain in the head was a prominent one, and is mentioned in five of the seven cases. In two of these the pain was on the side of the head corresponding to the abscess. In one it was referred directly to the ear.

Vomiting: Vomiting was a prominent symptom in only three, according to the notes of the cases. Whether present in the others, we can not say.

Epileptiform Convulsions: One case had a striking symptom which for a time baffled diagnosis. The history of this case is briefly as follows: (Case 3, H. A., adult, service of Dr. Clemens, admitted April 2, 1902, for pain in her ear of nine day's duration.) A simple mastoid operation had been performed two years before on that side. At the operation which was performed at once on admission, some rough bone was discovered in the antrum, but nothing else, and the wound was closed by silk sutures. Upon the first dressing three days after the operation, the wound was found clean. Three days later the patient became restless, complained of pain in the head, and ten minutes after the dressing had an epileptiform fit. These fits occurred daily. On the ninth day after admission she had nine attacks. The fifteenth day she became stupid and died on the sixteenth day after admission. The autopsy revealed an abscess in the tempero-sphenoidal lobe, containing 2½ ounces of pus. This was located but half an inch from the surface, and communicated by a sinus externally with an erosion discovered on the left temporal lobe near the base. Here an oval spot 1x½ inch was found showing cerebral softening. The abscess was lined with a pyogenic membrane, which showed numerous fresh hemorrhages. From this cavity another sinus extended to another large abscess just above the fissure of Silvius. A small perforation 4 mm. in diameter was

found in the tegmen tympani. It is to be added that the temperature was normal upon admission and until five days after the operation and then rose to 101. The pulse ranged between 80 and 100, and from 66 to 90 at the time of death.

Koerner regards convulsions as in no way characteristic of brain abscess. They are usually present in abscess of the cerebrum, and are limited to the extremities and the face of the opposite side. Such marked seizures as occurred in the case just stated we believe, however, are exceptional.

Temperature: Temperature in two cases was normal on admission. According to Koerner again, it can remain so through the entire disease, which is especially wont to be met with in the latent period. The pulse in every case was slow, below 100, even when high fever was present, and below 70 in four of the cases. Koerner regards this symptom as a valuable but unreliable one. This agrees with Schmiegelow, who in a recent contribution on this subject to the *Archives Internationales de Laryngologie* for April, 1905, in which he reports 19 cases of brain abscess of his own, does not find hyperpyrexia a characteristic sign of disease. It may be added that even pain which he regards as the most usual symptom to be met, was absent in two cases.

Cessation of Respiration: In two cases the interesting phenomenon occurred of cessation of the respiration during operation at the time the brain was punctured. In one of the cases the abscess was located in the cerebellum, and in the other in the tempero-sphenoidal lobe. In the first case respiration was maintained artificially for some time, and the heart continued to beat for five minutes. In the second case, one of Dr. Berens, a tracheotomy was performed, and the breathing so restored for three hours. Schmiegelow in the article just quoted, refers to a case of his own where a similar accident occurred. Macewen, in his well known work upon "Pyogenic Disease of the Brain and Spinal Cord," reports two cases of cerebellar abscess where this occurred. Besides these, Schmiegelow refers to one case reported by Barker, three by Sir Dyce Duckworth, one by Hoffer and one by Flies, making in all, including the two cases reported by ourselves, eleven cases where this phenomenon occurred, with only two exceptions the abscess being located in the cerebellum. The cause of this would seem in all probability to be due to a great increase of intra-cranial pressure paralyzing the respiratory center.

Finally one other case is of such unusual interest that we desire to refer to it somewhat at length. Case 4, G. M., age 14, a case of Dr. Kenyon, was admitted March 29, 1900, to the hospital with the history of pain and discharge from the ear for three weeks. The following day a mastoid exenteration was performed. Pus was encountered and a free opening was made into the middle ear through the antrum. In the course of the operation the dura was exposed. The wound was closed by sutures to heal by the contained blood clot. Upon June 2 there was some suggestion of pus in the dressing, and the wound was not uniting properly. June 4 the stitches were removed under ether, the wound cleansed of the granulations which had formed, and packed with sterile gauze. Upon June 10 severe pain was complained of in the forehead and in the side of the head. Ether was again administered and the dura found bulging at the spot previously exposed at the first operation, and was opened. A free discharge of foul pus was obtained. A counter opening was made through the temporal bone and the brain cavity packed. Previous to the operation the right pupil was found dilated to twice its natural size. This phenomenon disappeared after the operation. The wound was dressed by means of gauze drainage, and the boy discharged from the hospital July 30, two months after admission, about well. The bacteriologic examination of the smear from the ear showed a few streptococci. Temperature before abscess was opened was 101 F., and so continued for one week afterward. The pulse before the operation ranged from 96 to 92, gradually falling from 80 to 76, at one time to 66 after the operation. On October 2 of the same year, two months after his discharge from the hospital, he was readmitted because of a return some weeks before of the ear symptoms, and a second operation upon the brain was performed the following day, and pus was found beneath the dura extending forward to the frontal lobe; 2 ounces were evacuated. The wound was packed with plain gauze. The following day the patient was restless and noisy. Three days after the operation of. At the time of dressing, the wound was found clean. For he was delirious, on the eighth day headache was complained the next two weeks constant pain in the head was complained of, requiring the use of morphine. Chills now developed. On about the 31st of October, one month after admission he died.

The temperature was high and of a septic character throughout the disease. Pulse ranged from 30 to 140. No autopsy.

Remarks: Here without much question was a case of infection due to imperfect drainage at the time of the original mastoid operation. Reference will be made later to immunity to danger in most cases where the brain is exposed. This must be regarded as an exception. The second point is the character of the dressing, namely, packing with gauze. Most of our successful operators condemn this as a dangerous procedure. Finally the remarkable slowness of the development of the symptoms must be noted. Such improvement as to warrant discharge from the hospital and the remaining away for two months is certainly a surprising phenomenon.

III. MENINGITIS.

Of the 30 cases of which records are given, 29 died, 1 recovered. Of these six were those of children, two years or under. One was in a child of six and one in a child of eight. The rest were adults. In 15 cases there was a chronic suppuration of the middle ear, in 10 an acute suppuration, in 4 the condition was not given, and in 1 it was apparently healthy.

The bacteriologic findings can be regarded in no way conclusive. In three cases the streptococcus was found, in six the diplococcus, and in six there was a mixed infection. It would only be suggested from this small number of fifteen cases where the results are stated that the mixed infection is of as common occurrence as the diplococcus, and twice as common as the streptococcus.

The lumbar puncture was not practiced in enough cases to permit of any report.

Symptoms: In fourteen cases the temperature upon admission is stated. In nine of these it was normal.

Vomiting was a characteristic symptom in four cases.

Headache was present in nine cases.

Vomiting, according to Barber, can be regarded only as a symptom of intra-cranial disease, and is never solely characteristic of brain abscess, nor yet of meningitis. Among the numerous symptoms a sudden blindness developed in one case the day before admission. At the autopsy miliary tubercles were discovered lining the pia,—the blood vessels of the brain were generally congested.

In one case the symptoms followed a furunculosis of the auditory canal. The *channel of infection* is not definitely stated, except in two cases where it occurred through the tegmen tympani. In one case the symptoms followed an acute abscess of the middle ear, the result of infection through the nose following the use of a Birmingham nasal douche.

Optic Neuritis: Optic neuritis was met in one case. ,

The single case of not fatal result is of sufficient interest to be briefly referred to.

(Case 29.) It concerns a child of two, a patient of Dr. Haskin, who was admitted to the hospital July 7, 1902, for a secondary mastoid operation. A discharging sinus was found over the right mastoid near the tip. At the time of the operation granulations were found in the attic and antrum. The sinus was exposed and found healthy. The case eventually recovered, and was discharged from the hospital three weeks after operation. Two weeks later he was readmitted with a temperature of 104, very restless, with twitching of the muscles of the right arm. The right pupil was dilated and there was slight facial paralysis. The following day, he vomited, and there was a paralysis of the right side. On the 17th he was apathetic, but on the 19th appeared brighter. The mastoid wound looked better. Upon the twenty-third day the paralysis had about disappeared. Upon the 20th of September he was discharged. Later he was readmitted for skin grafting. In personal conversation with Dr. Haskin, this case which he has previously reported, he regards as of a tubercular nature. The child is still under observation. This case suggests the possibility of recovery after the serous form of meningitis. Up to recently such a termination was not entertained, but in the last few years several authorities, Koerner among others, have called attention to this, and a number of cases are on record where such a result apparently has taken place.

Meningitis Following the Radical Operation: Of great interest is the number of cases following the radical operation, ten in all. In these the temperature was normal at admission in all but two. It is a striking fact in what a large number of cases of simple mastoid operations, as well as in the so-called radical operations, the dura is exposed with no unpleasant sequelæ. Rarely is another thought given to it. Indeed it is the practice of some surgeons to go so far as to apply skin grafts

upon the dura at the time of the primary operation. That this can be followed by disastrous results is witnessed by these ten cases. This is still more clearly evidenced by the fact that in cases 4 and 19 the post-auricular wound was not closed at the primary operation, and no symptoms of meningitis developed until two days after the second operation, when skin grafting had been practiced and the wound closed. In the second of these two cases rubber tissue was used for packing the wound at the first operation. Both the sinus and dura were exposed at that time.

That this experience is not limited to the institution in question is shown by the statistics from the New York Eye and Ear Infirmary, where out of twenty-two cases of meningitis, seven followed the radical operation. The writer in a paper read before the Eastern section of this society here in Boston two years ago took occasion to state that this operation must "not be regarded as free from risk to life." This warning note seems amply justified in the light of these nineteen deaths in two institutions following the operation. In the ten years from 1895 to 1905, 1195 mastoid operations were done at the Manhattan Eye, Ear and Throat Hospital, of which some eighty-three were of the radical type.

These startling figures, viz., out of eighty-three radical operations ten cases of fatal meningitis, or one in eight, developed is enough to give us cause for thought, and bids us exercise the greatest care in selection of our cases, in our technique, and in employing the most perfect asepsis. At the same time it is only fair to add that meningitis also followed the simple mastoid operation in twenty cases, or one in thirty-six.

This shows that the simple Schwartze operation can be followed by fatal consequences, but in the case of the radical operation the proportion is vastly greater. The grave question is also raised of the wisdom where the dura is exposed of closing the wound at the first operation, and especially of skin grafting at those points.

Conclusion: In conclusion the writer desires to emphasize the importance of greater attention on the part of the surgeon in charge to the taking and preservation of the histories of his mastoid cases. Too often this is left to the junior house officer, who has had little or no experience, and who is apt to make records of observations which are of little or no value. The only one competent to make the records is the surgeon himself,

and this he can easily do by dictation to the house officer at the time of his daily visit.

Three recommendations in this direction suggest themselves:

First, every special or general hospital with an ear service should have an ear registrar with whom the responsibility for the compilation and preservation of all records should rest.

Second, a card catalogue index should be provided with a cross index according to disease. The following letter will illustrate the difficulty of following out an investigation like this, without some such index catalogue:

"I have delayed answering your letter of March 30 because I wished to see whether it would be possible for me to comply with your request. I am sorry to say that after looking into the matter I find that the data I could give you would be so incomplete and really valueless that it would not be worth the labor necessary. In both the Pennsylvania and Polyclinic Hospital there is no record of cases kept in such a manner as to permit looking up under the nature of the disease, they are all indexed by the names of the patients. One of the assistants in my clinic started to look up the matter, but found that it would involve going over all the different cases admitted to the hospitals in recent years in order to find records of those cases presenting intra-cranial complications. We have no special hospital in this city devoted to ear, nose and throat work, and in the general hospitals the records of the ear cases are mingled with those of the others.

Third. Greater zeal and earnestness should be exercised on the part of the surgeon in charge toward securing autopsies. In this way, and in this way alone can the valuable material of the various institutions where otology is practiced be brought together for study and scientific research.

DISCUSSION.

DR. EDWARD BRADFORD DENCH *Opened the Discussion.*

For the discussion of the subject I have gone over my own operating book rather carefully, and have collected the following statistics:

I have observed twelve cases of brain abscess (nine temperosphenoidal, three cerebellar), thirty-eight cases of sinus thrombosis, (primary bulb infection in two), in thirteen of which the internal jugular was excised; twenty-eight cases of epidural abscess, and four cases of meningitis operated upon, eighty-

two cases in all. These statistics are fairly accurate, excepting as regards the statistics for meningitis. Under this heading many cases have escaped observation, as only those operated upon have been recorded.

From these statistics we find that the relative frequency of occurrence of the various intra-cranial lesions has been as follows: Epidural abscess, 34.1%; brain abscess, 14.6%; sinus thrombosis, 46.3%; general meningitis, 4.8%.

Of the sinus thrombosis cases the jugular was tied in 36.8%.

Regarding the mortality of the various conditions, of the twelve cases of brain abscess, three were cured, 25%, and nine died; of the thirty-eight cases of sinus thrombosis, thirty-two, 84.3%, were cured and six, 15.7%, died. In twenty-five cases the internal jugular was not excised, and of those cases where excision was not performed there were twenty-two cures, 88%, and three deaths, 12%. In thirteen cases, the jugular was excised, and of these ten cases , 77%, recovered and three, 23%, died. Of the four cases of meningitis operated upon, one, 25%, was cured and three died, 75%.

Going over these statistics more in detail, and considering, first, the cases of brain abscess, the fatal termination in this class was due to an extension of the inflammatory process to the meninges, either through the subdural space or by way of the ventricles, usually by the latter route.

Of the two cases of epidural abscess which terminated fatally, one case died of diabetes, which existed before the operation was performed, and the second case died of general meningitis, and is reported under the cases of meningitis operated upon. It, therefore, strictly speaking, should not appear in this category.

The greater mortality which appears in the series of cases in which the jugular was excised, simply depends upon the fact that these cases were much more severe than the cases in which jugular excision was not performed. Of the three fatal cases, which followed excision of the jugular, one died of septic pneumonia, which developed the evening after the operation was performed, the case having been under observation only thirty-six hours. A second case died of general sepsis, in which a previous pneumonia prevented early operative interference. The third case died of hemorrhage into the spinal canal, all symptoms of sepsis having disappeared at the time of death, and the wound in the neck having entirely healed by first intention.

Of the three fatal cases of sinus thrombosis, in which excision of the jugular was not performed, one died of diabetes, a second died of pneumonia, and in the third case the cause of death is not recorded.

Of the meningitis cases, one was cured by operation, simply by drainage of the subdural space. In the three other cases, drainage of the ventricles was attempted, and all the cases died.

It should be stated, in regard to these statistics, that three of the cases are repeated in the history; that is, one of the fatal cases of sinus thrombosis, which suffered also from an epidural abscess, is reported as a fatal case in both instances. The same is true of another fatal case of epidural abscess, which was also operated upon later for serous meningitis. The third case, reported in two places, is a case of sinus thrombosis, with excision of the internal jugular, which later developed a meningitis, and which was drained successfully, but the patient subsequently died of hemorrhage into the spinal canal.

From these statistics we find that the two classes of cases which are attended by the greatest fatality, are brain abscess and diffuse meningitis, either of the purulent or serous variety. Epidural abscess and sinus thrombosis, including those cases where the jugular demands excision, need not be looked upon as being of such a very serious character, if the cases are operated upon early.

Regarding the necessity of interference with the jugular vein, in cases of sinus thrombosis, this, I think, must depend upon the condition present in each individual case. In most of the cases which I have seen, the jugular has been excised at the first operation, where extensive thrombosis of the sinus was present, that is, a thrombus extending down into the jugular bulb, and where it was impossible to obtain a free return current of blood after the introduction of the curette deeply into the *bulbus jug-* after the introduction of the curette deeply into the *bulbus jugularis*. In one instance this was not done because the sinus was completely obliterated, evidently as the result of an old inflammation. This patient made a complete recovery. In a second case a thrombus was found in the sinus during the course of a mastoid operation, the patient having exhibited at no time symptoms of sinus thrombosis. In this instance free curettage was instituted, and although no hemorrhage was

obtained from the proximal extremity of the sinus, it was decided to wait for several days to see if any temperature developed characteristic of septic infection. This patient made a complete recovery, and never had a rise of temperature above 99°, showing that the thrombus in the bulb had become organized, and was not infectious in nature. In a third case, owing to the weakness of the patient at the time of operation, it was deemed inexpedient to excise the jugular at the time of the primary operation. The patient was returned to bed, stimulated freely, and twenty-four hours later, there having been a slight rise in temperature, the jugular was removed. This case made a perfect recovery.

As a general rule, therefore, it has been my practice to consider hemorrhage from the proximal end of the sinus as a contraindication to immediate interference with the jugular.

I am perfectly well aware of the fact that free proximal hemorrhage does not necessarily mean that the jugular bulb is free, but it is rather strong presumptive evidence of this fact. Hemorrhage may, of course, come simply from the petrosal sinus, but certainly, in my own experience, it has seldom been necessary to excise the jugular in cases where there was a free hemorrhage from the proximal end of the sinus at the time of operation.

The statistics must vary, of course, according to the practice of each individual operator. Supposing, for example, that I had excised the internal jugular in the twenty-two acute cases of sinus thrombosis, which were cured without interference with the vein. As the operation upon the jugular is not particularly difficult, although sometimes tedious, these cases would undoubtedly have recovered, and the statistics would have been overwhelmingly in favor of interference with the vein. It seems to me therefore, that the advisability of excision of the jugular must depend upon the conditions present at the time of operation, in any individual case. Where there is evidence of extensive involvement. as shown either by the condition of the patient or by the condition of the sinus, at the time of operation, immediate interference with the jugular is not only advisable, but is strongly indicated.

In cases where but a small thrombus is present, I think it is better surgery to remove the clot, and wait for the development of symptoms.

As to the advisability of suturing the wound in the neck

at the time of operation, I have done this in most of my cases. In fully 50% the wound has healed by first intention throughout; in fully 75% of the remainder, most of the wound has healed by first intention, a small sinus remaining at the inferior angle of the wound for several weeks after operation. In only three cases that I can remember, has it been necessary to reopen the wound in the neck, for its entire length. It has usually been my practice to insert a small drain at the lower angle of the wound, and not to attempt complete obliteration of the "dead space" in the neck caused by the removal of the vein. The upper end of the wound, just beneath the mastoid, is also left open, and a firm packing of iodoform gauze introduced here, in order to isolate the upper extremity of the divided vein from the neck wound, and thus prevent infection of the freshly incised surfaces. I believe, therefore, that excepting in very septic cases, primary suture of the wound in the neck is indicated.

Regarding the frequency of occurrence of sinus thrombosis in acute and chronic inflammations, I can only say that I have seen thrombosis of the sinus in both conditions. While it is impossible for me to give the exact figures from my statistics, I would say that the condition occurred with about equal frequency in chronic and acute inflammations. Some of the most severe cases that I have seen have followed acute inflammation of the middle ear, and I think that this is rather the rule, where the bulb is primarily affected, although I have seen cases of primary bulb involvement in an acute exacerbation of a chronic middle ear inflammation.

Concerning the symptomatology of sinus thrombosis in the typical cases, very little need be said. The characteristic temperature curve is sufficient, in most cases, to enable one to make a certain diagnosis.

The blood count, in these cases, is rather interesting, in that in no case has the leucocytosis been very high unless there has been some secondary septic deposit, either in the viscera or superficial tissues.

Regarding the cases which present an atypical clinical history, that is, those cases which run a continuous high temperature, I have seen one or two such cases. Here the absence of other conditions to account for the high temperature, as indicated by symptoms referred to the abdominal or thoracic viscera, or to the joints, or to the meninges, would, I think,

usually enable one to make a diagnosis, although the diagnosis must, of course, remain somewhat uncertain. In one case, where the only symptom was a continuous high temperature, excision of the jugular, together with clearing out of the lateral sinus, was followed by a complete recovery.

Concerning the advisability of either ligation or resection of the jugular, as the primary step of the operation, I should hardly be inclined, from my own experience, to endorse this procedure. The only reason why the vein should be interfered with, as a primary step, is the danger of air entering the general circulation, upon opening the sinus. This danger is reduced to a minimum if, before the sinus is opened, an assistant places his finger over the internal jugular in the neck. Remembering that the jugular in the upper part of the neck lies just behind the carotid, and that it crosses the common carotid at about the level of the cricoid cartilage, and also, that it is always superficial, firm pressure on the neck in this region will certainly prevent the aspiration of air into the vein at the moment of opening the sinus. While there is no objection to exposing the jugular just beneath the omohyoid muscle, and putting on a temporary ligature, before opening the sinus, such a procedure occupies considerable time. Not so much time is occupied in finding the vein as in preparing the neck, changing the position of the patient, and temporarily covering the mastoid wound, so as to prevent any infection of this from without. In some of these cases the more rapidly the operation is done the better for the patient, and as there are a certain number of cases in which interference with the vein is certainly not called for, it seems wise to me to explore the sinus first, rather than to interfere with the vein before finding out exactly what there is in the sinus.

Regarding the relative frequency of the occurrence of brain abscess, in cases of acute and chronic suppuration of the middle ear, most of my cases have occurred either where there has been a suppurative inflammation of long standing, or where there has been a previous history of an acute inflammation, which, apparently, had entirely resolved. This latter statement seems to me one of no little importance. In one of the fatal cases there was a history of an acute inflammation of the middle ear ten years before. When I saw the patient she was suffering from what appeared to be an acute middle ear inflammation of about two weeks' duration, with a compli-

cating mastoiditis, and yet when the brain abscess was subsequently opened the destruction was too great to be explained by so short a history. In another case, where the symptoms were apparently acute, there was a history of earache a year before, and a second attack about a month before the symptoms of brain abscess appeared. When the abscess is situated upon the right side, localizing symptoms are rare. It seems to me that there the diagnosis must be made upon the slow pulse, either a septic or a subnormal temperature, the septic temperature occurring in the acute and the subnormal temperature occurring in the chronic cases, together with the fact that the patient gradually becomes weaker and weaker, and steadily loses flesh. This gradual wasting away of the patient, without any sufficient reason, in cases of aural suppuration, should always be regarded, I think, with suspicion, particularly if the pulse is slow.

The blood count, in such cases, materially aids in the diagnosis. A high percentage of polymorphonuclear cells, that is, a percentage above 80% or 82%, pointing as it does, to the presence of pus in some part of the body, would be a strong indication for the surgeon to explore the brain, if a suppurative lesion in every other situation could be positively excluded. While a low pulse rate is a valuable diagnostic sign, it must be remembered that it is not always present, or occurs, in many cases, as rather a late symptom.

In cases of acute brain abscess, where the purulent focus is small, the pulse may be increased in rapidity.

Regarding the sudden failure of respiration, at the time of operation, I have seen this occur in one case, in which the diagnosis was only made post-mortem, the case having been operated upon for sinus thrombosis.

Epileptiform convulsions have occasionally occurred in some of my cases, but, as a rule, only in the late stages, and I should hardly regard their occurrence as a symptom indicative of suppuration within the brain.

Regarding the proper method of operative interference in brain abscess cases, I am inclined to think that the otologist occasionally errs in his exploratory operations, from the fact that he seems to consider it necessary to interfere in the direct anatomical region of the ear. Where the localizing symptoms point to a brain abscess, remote from the ear, as for instance, an abscess in Broca's convolution, it seems absurd to attempt

to open this abscess, either through the tympanic roof or immediately above the external auditory canal. Broca's convolution should be exposed and the abscess drained, independently of the mastoid wound. The same rule would apply to abscesses located in the motor tract, although, of course, these seldom occur, as the result of middle ear suppuration.

In cases where the localizing symptoms are indefinite, or where they are complex, that is, where there are certain ocular, auditory and motor symptoms combined irregularly, in other words, where no definite cortical lesion can be demonstrated, it seems more than probable that the lesion is located in the internal capsule. In such a case, the exploration would be most effective just above and behind the external auditory meatus, as the parts involved would be more easily reached from this region than from any other. It seems to me that cases of drainage through the tympanic and antral roof, should be restricted to those instances where on exposing the dura in this region, the dura is either discolored or presents a fistulous opening. To explore what may be a healthy brain, through a septic field, would seem rather unwise.

Regarding the drainage of these cases, gauze was used in two successful cases, and drainage tubes in another successful case. In future, I shall be rather in favor of the cigarette drain, that is, plain absorbent or iodoform gauze wrapped in rubber tissue, the purpose of the latter being to protect the incised brain tissue from infection by the pus as it passes from the abscess cavity to the surface.

Of the cases of meningitis reported, two followed chronic suppuration and two acute suppuration of the middle ear. In two cases overlooked in preparing the above statistics, meningitis followed a chronic middle ear suppuration.

The operative treatment of meningitis is the most difficult and discouraging problem which presents itself. The character of the infection seems to be immaterial. In the successful case of which I speak in my statistics, the dura was opened and the subdural space drained immediately above the tympanic roof. In this case the temperature fell to normal in the course of two days after the operation, and the patient recovered with no complications. In the other cases reported, in which ventricular drainage was performed, death followed in every instance. In all of these cases, however, the ventricles were involved, so that ventricular drainage was demanded.

In two cases, not included in the above list, lumbar puncture was employed, but both cases terminated fatally.

In regard to what Dr. Harris says about meningitis following the radical operation, I would say that out of 150 radical operations, I have had but five deaths. In one case death was due to pneumonia, in two cases to meningitis, and in two cases to brain abscess. In one of the cases dying of menigitis a primary grafting was done, in spite of the fact that a small area of dura was exposed at the time of the operation. In the second case, dying of meningitis, no skin-grafting operation was performed. The wound was simply packed in the ordinary manner, and allowed to heal by granulation; so that, in this instance, the introduction of skin grafts certainly played no part in the production of the meningitis. In one of the fatal cases of brain abscess, the presence of the abscess being discovered only after death, a primary grafting had been done. The quantity of pus found in the brain, however, clearly showed that the abscess had antedated the radical operation. In the second fatal case of brain abscess following operation, the abscess was acute. In this instance, a secondary skin grafting was done fourteen days after the primary operation At the time of the radical operation, the dura was not exposed in any locality.

The statistics of Dr. Harris, then, while valuable, seem to show that in a certain number of cases the radical operation is followed by death,—not as a direct result of the operative procedure, but simply from an intra-cranial lesion, which must have existed for a long time previous to the performance of the operation for the relief of middle ear suppuration.

Dr. Wendell C. Phillips, of New York, said that the series of papers just presented very completely covered the subject, and little could be added in the way of criticism. The suggestions they contained and the methods outlined were entirely in harmony with the experience of men who were engaged in this line of work. There were one or two points, however, that the speaker said he wished to emphasize, and one was in connection with Dr. Smith's paper. Statistics showed that injuries to the head were quite frequently associated with attacks of meningitis from middle ear suppuration. Dr. Phillips said he could recall one or two instances in his own series of cases of chronic middle ear suppuration going on for years until the patient received an injury to the head,

and this was followed by an intra-cranial complication. Such a sequence was not difficult to explain. The only barrier between the suppurative process in the ear and the brain was a rather thin plate of bone, and it was quite probable that a severe injury to the head might be the actual exciting cause of the intra-cranial complication.

Dr. Smith, in his paper, tried to differentiate between the different varieties of meningitis, and Dr. Phillips thought that many of the points brought out were correct. As a general statement, it might be said that meningitis, in contradistinction to brain abscess and lateral sinus thrombosis, was more frequently associated with severe and long continued pain in the head. While pain might be present in all varieties, that accompaning meningitis was more intense than that complained of in the other forms of intra-cranial complication.

Temperature could not be relied upon as a characteristic symptom, except that associated with sinus thrombosis. In that condition it was quite characteristic when the sinus had become extensively diseased—not in the early stages. The speaker said he had recently opened a lateral sinus in which the diagnosis was based largely on the temperature variations, ranging from high to sub-normal.

Dr. Phillips said he did not regard the pulse as particularly characteristic of any of the conditions under discussion excepting sinus thrombosis. A rather well-marked chill could also be looked for in that condition, and this was not at all common in the meningitis cases. He did not think a chill could be regarded as one of the symptoms in differentiating between brain abscess and meningitis.

The speaker said he was surprised that greater emphasis was not placed upon the importance of lumbar puncture. He had come to make use of it in practically all of his cases of meningitis, and by making a careful examination of the cerebrospinal fluid the exact character of the intracranial condition could often be determined.

In regard to hernial protrusions following large openings in the skull, the speaker said it was now generally recognized that the main portion of the protruding mass was not brain tissue at all, but granulation tissue, and it could be sliced off to the level of the bone with comparative immunity.

In differentiating between lateral sinus thrombosis and brain abscess, the mentality of the patient often proved a val-

uable and helpful symptom. As Dr. McKernon had pointed out, cerebration was rarely interfered with in the former condition, the mind usually remaining clear until a late stage, whereas with brain abscess we were very apt to get early signs of mental impairment, and the same was true of meningitis.

The fact could not be too strongly emphasized that serious intracranial complications were more frequently observed in connection with chronic than with acute middle ear disease, and this should be regarded as an additional reason why those cases should receive more careful consideration than they did. A minute examination of the histories of acute mastoid cases would often show that they were really complications of chronic suppuration of the middle ear. These patients not infrequently neglected to give a history of former ear discharge, or of previous milder attacks of mastoid involvement. This was an argument in favor of the radical operation in selected cases, where the opinion was well grounded that further local treatment would prove of no avail.

Dr. Harris' paper contained the statement that among thirty cases of purulent meningitis there was one recovery. In that single instance, Dr. Phillips said, the meningitis was probably serous in character. The purulent form he regarded as invariably fatal, and he thought it was useless to operate on such cases. In two instances of supposed purulent meningitis that came under his observation during the past winter, the condition proved to be epidemic cerebro-spinal meningitis. One of these recovered, the other died. These cases had been reported in full at the recent meeting of the Amrican Otological Society.

Dr. Charles W. Richardson, of Washington, D. C., said there were some points that he thought were not sufficiently emphasized in the paper on meningitis. One was, the improbability of any form of treatment being beneficial in pure lepto-meningitis. The Germans had reported good results from lumbar puncture, but those were probably not cases of pure lepto-meningitis. The speaker said he had operated on three such cases without any effect, the patients rapidly succumbing to the disease. This was not surprising, when we considered the character of the lesion in these cases. Masses of purulent exudate covered the surface of the brain, and invaded the interlobular fissures, rendering recovery practically impossible.

In Dr. Jack's excellent paper there was one point that was not sufficiently emphasized, and that was in regard to the aphasia that occurred in the left-sided cases. This aphasia was usually one of the earliest symptoms. Of course, it did not occur in the right-sided cases (excepting in left-handed patients), but when it came on in the course of suppurating ear disease, even without other symptoms, the occurrence of a brain abscess on the left side was very probable.

Dr. Richardson said that in the treatment of the radical mastoid wound, he did not look with favor upon the application of skin-grafts to the freshly exposed dura. He regarded that as a bad method of treatment. The application of skin-grafts was apt to give rise to the development of granulation tissue, and cause unpleasant symptoms. The speaker said he was also opposed to the treatment of the wound by the formation of a blood-clot, as that was another method by which infection could be readily carried into the cranial cavity.

XLVII.

PERSONAL ATTENTION AN ESSENTIAL FEATURE IN THE TREATMENT OF CHRONIC AURAL DISCHARGES.

By F. C. Hotz, M. D.

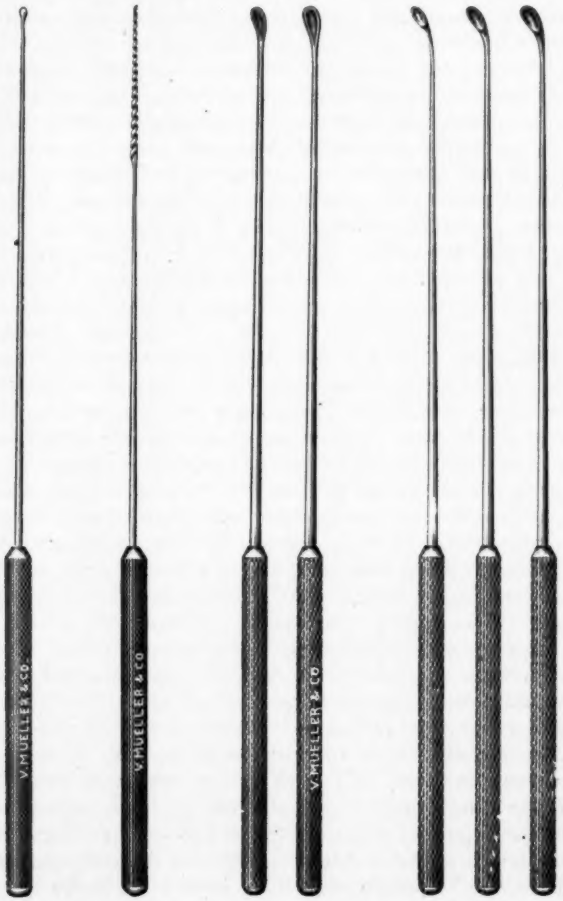
CHICAGO.

Chronic otorrheas present a great variety of conditions. In some cases the discharge is maintained by a simple catarrhal inflammation; in other cases by caries and necrosis; in other instances, the mucous lining is ulcerated or covered by granulations, or polyps are present. Again, the membrana tympani may be altogether absent or show a partial destruction, only, in a perforation varying in size and location.

It is evident that these conditions so different in their nature cannot be treated successfully by one and the same method, but in each case the treatment must be modified to suit the existing conditions. And yet we see quite often the same routine treatment applied to all sorts of cases. The patient, for instance, is advised to syringe the ear every day once or oftener and to drop in afterwards some solution. Now, while injections may remove all the secretions from the tympanic cavity if the membrana tympani is altogether destroyed, they remove only the discharge from the meatus, but do not cleanse the tympanic cavity, if there is only a partial destruction, or if the discharge comes from the attic. Time and again, I have had occasion to demonstrate to my students the inefficiency of the syringe under such circumstances, by removing from the tympanic cavity or the attic large amounts of sticky mucus or even inspissated masses, though the patient, as he assured us, had used the syringe conscientiously every day as directed by his aurist. All that the syringing can accomplish under these conditions is to wash out the meatus, but this is simply a matter of cleanliness and does not affect the disease, for it is the secretion retained in the tympanic cavity and attic, not the discharge in the meatus, which exerts an injurious effect and which we desire to remove.

If the perforation of the membrana tympani is very large, instillation of solutions can reach the mucous membrane and

favorably influence a catarrhal otitis; but they are valueless in the presence of granulations, polyps, caries, necrosis, etc., and they are inefficient even in the simple catarrhal condition



if the perforation is small, because very little enters the tympanic cavity through a small perforation.

I have long since become convinced that this home treatment can accomplish very little in chronic otorrhea, but that excellent results can be obtained—and often in apparently desperate cases—if the surgeon takes the treatment altogther in his own hands and treats the pathologic conditions directly with instruments or medicines as the case may be. To carry out this treatment successfully one must have instruments with which one can reach every nook and corner of the tympanic cavity and attic. The probes, applicators, and curettes usually furnished by the instrument makers are not satisfactory because usually made of steel they cannot be bent to fit the anatomic conditions presented by the different cases. The instruments which I have been using for many years and which have given me excellent service are: 1. A fine probe made of pure silver (Fig. 1) the end of which can be bent short to any angle so that we can explore with it every point of the tympanic cavity and the attic. 2. Applicators made of sterling silver (Fig. 2); the handle is corrugated so that the lightest touch of the fingers can control their movements; the stem is two and one-half inches long and ends in a corkscrew spiral, three-quarters of an inch long, around which cotton can be wound very securely and yet can be taken off very easily. The spiral can be bent like the probe to any suitable angle to carry medicines directly to any corner in the tympanic cavity and attic. 3. Small spoons like cataract spoons (Fig. 3) made of the same material and with the same stem and handle as the applicators. As the edges of these spoons are not sharp but smooth, inspissated matter can be scooped out without any possible lesion to the lining membrane. 4. Small steel curettes (Fig. 4) with a flexible stem so that they can be set at the proper angle for scraping carious parts or removing large buttons of granulations. 5. An attic syringe.

Supplied with these instruments we proceed in every case of chronic otorrhea as follows: The meatus is cleaned out with the cotton on the applicator and after an ocular inspection, the regions not visible (behind remnants of the membrane tympani, the peripheric corners of the tympanic cavity, and the attic) are carefully explored with the probe to ascertain their condition, whether there are inspissated masses, granulations, polyps, carious or necrosed spots.

Carious or necrosed ossicles are removed at once. Inspissated secretions and cholesteatomatous masses are removed

with the silver spoons; the removal is done more thoroughly and rapidly than with the attic syringe, the current of which is not strong enough to dislodge firmly impacted masses; the syringe is used only for the final washing out.

Large granulations are cut off by the curette and large polyps are removed by the snare. The presence of small polyps and granulations, which cannot be seen directly, can be detected and located by means of the applicator; for as they bleed very easily the cotton around the spiral of the applicator will show a blood stain when it is introduced in various directions into the tympanic cavity and the attic and comes in contact with granulations. The granulations or small polyps thus located are then treated directly; for this purpose a very little cotton is tightly wound around the spiral and dipped into deliquesced chromic acid and the spiral is then bent so that it brings the acid in direct contact with the granulations. Under these applications repeated every three days the granulations quickly disappear and often the discharge ceases with their disappearance. If it continues we apply directly and thoroughly over the diseased membrane, by means of the flexible applicator, silver nitrate, protargol, argyrol, camphoroxol or any other medicine called for by the existing conditions. In the same way the ulcerated membrane is treated after the removal of cholesteatomatous masses.

This treatment is continued and the case is not to be considered cured until the cotton applicator shows a perfectly clean condition; that is to say, the cotton rubbed over every part of the tympanic cavity and attic must remain perfectly dry and clean. And this test must be repeated and prove satisfactory at intervals of several weeks after the treatment has been stopped. This is of very great importance; for toward the end of the treatment the secretion is very scanty and forms a thin film of moisture over the tympanic cavity or dries up to thin scabs in the attic. The inspection would find the ear apparently dry and induce us to consider the case cured; exploration with the cotton applicator, however, informs us at once of the true condition by the moisture on the cotton or the little scabs it brings down from the attic.

I am convinced by my experience that this personal treatment yields good results in many cases which otherwise would have to go undergo the radical operation. But there are conditions in which even this treatment would avail nothing and

the radical operation is plainly indicated as, for instance, in extensive caries and necrosis of the tympanic walls or attic. The treatment here outlined does not take up as much time of the patient as one might think; though in some cases in the beginning three treatments per week are necessary for a short time, in the most cases two treatments are sufficient and towards the end of the treatment the intervals between attendance can be made even longer. The regular attendance required of the patient may sometimes cause him some inconvenience, but that is certainly no reasonable excuse for changing our plan for one which might suit the patient better but accomplish less. If we are firmly convinced a certain course of treatment is the road to success we wrong our patient and ourselves if we do not strictly adhere to it, for if we depart from our course the patient will not be benefited and our reputation will suffer by our failure to cure the case.

A few clinical reports may serve to illustrate and prove the merits of the treatment here recommended.

1. *A rather simple case in which the radical operation had been urgently recommended.*—In the beginning of January, 1903, a Miss O., 25 years old, consulted me about her right ear, the hearing of which had been failing during the past four years. One year ago earache for three days, which was followed by a discharge that had continued more or less ever since. Never had any mastoid symptoms, or headaches, or vertigo. During the past four months had been treated by an aurist, who finally insisted upon the radical operation as the only means of a cure. The treatment had consisted in syringing, instillations of medicines and occasional examinations of the aurist. Patient rather delicate, hears loud voice two feet, Rinné negative. Slight mucopurulent discharge of a very bad odor, though the ear had been syringed every morning; an oval perforation in the lower anterior segment of the membrana tympani and tympanic cavity filled with soft easily-bleeding granulations, but the probe carefully passed in every direction failed to detect caries or necrosis. Mastoid region normal. Liquid chromic acid was applied by the applicator through the perforation directly on the granulations twice a week, and on February 12 the tympanic cavity was cleared of all granulations, its lining was smooth and the discharge had ceased. The lady then went to California,

and on her return in June I found the ear still dry and the perforation smaller. I saw her again in October, 1904, and last May and found the ear still in the same satisfactory condition.

2. *Otorrhea of fifteen years, vertigo from impacted dry secretions.*—Mrs. McPh., 42 years old, came to me in June, 1902, with the history of an otorrhea of the right ear of fifteen years' duration. Twice, polyps had been removed. During the last four months she had occasionally slight earache and suffered much from dizziness, especially when the syringe was used. Hears watch at contact and the acumeter at 85 centimeters. Anterior half of membrana tympani absent, posterior half sclerosed, tympanic cavity packed with inspissated matter, the removal of which required several sittings because the manipulations with the silver spoon, though executed with the greatest care and gentleness, were very painful and caused nausea and dizziness. But after all impacted masses had been removed the patient was permanently relieved of vertigo. In the anterior recess of the tympanic cavity I found a mass of granulations so sensitive to the touch of the cotton-tipped applicator that I had to proceed very cautiously with the application of the chromic acid. By the middle of July the granulations had disappeared, the discharge had ceased and the ear could be explored with the probe in every direction without causing any pain or dizziness.

July 1, 1903, the patient returned with a slight discharge: no granulations; no dizziness. The tympanic cavity was swabbed with protargol (ten per cent) every day for one week and then every two days during the next two weeks when there was no more trace of any secretion. The ear has remained well up to the present time.

3. *Case of otorrhea for thirty years, referred to me for radical operation, but relieved by persistent personal treatment.*—In January, 1904, Mrs. O., 58 years old, was referred to me for radical operation. For thirty years her left ear had been discharging more or less; recently she had the constant feeling of a heavy weight on her head and suffered much from dizziness; she was afraid of walking alone in the street, as she was constantly swaying to the right side. No headaches. Hearing reduced to perception of loud sounds; constant noise of escaping steam; membrana tympani absent; necrosed malleus fastened to promontory by cicatricial bands and surrounded by granulations. Tympanic walls covered

with dry crusts under which, however, the surfaces were smooth and pale. The attic was filled with inspissated masses which were so hard and firmly impacted and the most gentle working with the spoons caused so much nausea and dizziness that I had to go on very slowly. It took a whole week to clean the attic, but when it was done the patient was relieved of that heavy pressure on her head and the dizziness was much lessened and disappeared entirely in the course of two weeks. The attic walls were treated by direct applications of silver nitrate and camphoroxol alternately. In February the necrosed malleus was removed and the granulations were destroyed by chromic acid. March 15 the patient was allowed to return home, as during the past ten days the repeated explorations with the cotton applicator had shown a perfectly dry state of the attic.

The patient felt well until the end of November, when the ear began to discharge again and the dizziness also returned. She came back to me on December 29, and I found the tympanic cavity and attic filled with soft, thickened matter. It was easily removed with the spoon and gentle injections with the attic syringe. The discharge from the attic was not profuse, but slightly blood stained, showing an ulcerated state of the lining. Direct applications of silver nitrate (two per cent) quickly improved conditions and in the middle of January the ear was dry again and the patient free from dizziness. The lady called for an examination in February and again in June on her return from a trip to Europe, and on both occasions the ear was found in satisfactory condition.

4. *A rather stubborn case requiring five months of regular personal treatment.*—In 1888 Mrs. B., 52 years, had an otitis media suppurativa, with a discharge lasting five months at the time and recurring at different intervals. I first saw her in 1893, when I found a moderate discharge of mucus from a perforation in the posterior half of the membrana tympani, but the lady was not so much concerned about the discharge from her right ear as about paroxysms of sharp pains behind her left ear during four days, as she feared she was threatened with an inflammation in the left ear as she had in the right ear five years ago. The examination showed normal hearing and normal conditions of the left ear; and as the patient had frequent attacks of rheumatism in her life I suspected these pains behind the left ear were of a rheu-

matic nature and the quick relief obtained by sodium salicylate certainly seemed to confirm my opinion. Between 1893 and this year the lady had a number of such neuralgic attacks, sometimes behind the left ear, sometimes behind the right ear, and they were always promptly relieved by sodium salicylate. Neither ear showed any signs of inflammation at any of these attacks. From 1896 till 1904 there was no discharge from the ear, but it began again in October, and as it continued and became quite offensive, the patient finally made up her mind to take treatment in April of this year.

At that time the discharge was quite profuse, saturating the cotton in the meatus in six hours. Only a narrow rim of the membrana tympani left; malleus and incus gone; walls of the tympanic cavity pale and smooth; the attic very sensitive to the touch of the probe and traces of blood on the cotton of the applicator; no caries or necrosis. Under applications of camphoroxol to the attic the discharge soon lost its offensive character and gradually became less. In May, a few small granulations appeared on the edge of the tympanic wall of the attic; they were exceedingly sensitive, the slightest touch with the probe causing violent pain and the first application of chromic acid causing a profound fainting fit, which lasted over ten minutes. In June, the attic was healed, but there was still some discharge, the source of which I discovered in a mass of spongy granulations in the anterior recess of the tympanic cavity towards the Eustachian tube. On account of the extreme sensitiveness I did not like to use the curette, but applied chromic acid twice a week, the treatment lasting all through July and August. By September 15 at last all traces of granulations and discharge had disappeared and weekly examinations during October and November showed no return of disease.

XLVIII.

TUMORS OF THE EAR.*

By Antonie P. Voislawsky, M. D.

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Like tumors in other parts of the body, it is best to divide tumors of the ear into benign and malignant. While the former are, as a rule, harmless and require the aid of the physician solely on account of the unsightliness they cause; or on account of the difficulty of hearing which follows if they are seated in the meatus or the deeper parts of the auditory apparatus, the latter, on the other hand, present the same malignant features of this type of growth elsewhere.

If not eradicated, the tumor will either extend superficially over wide areas, or else will travel into the interior of the skull so that even extensive surgical interference will not be life-saving. Such extensive tumors are fortunately of less occurrence now than formerly, for, with the education of the masses and the increasing fear of carcinoma prevalent, the aurist is more likely to see the disease in its earlier stages, when the diagnosis may still present difficulties. Since like in other parts of the skin, a close connection exists between eczema and allied skin lesions on the one hand and malignant disease on the other, the greatest caution will often be in place in giving the proper diagnosis.

Benign Tumors.—Fibroid tumors are common, both as fibroma durum and molle. Their most common site is naturally the auricle, since fibrous tissue is abundant here. A form of keloid may be included among these tumors, which frequently develops from the puncture made in the lobule for wearing ear-rings. This is seen most often in the black race,

*Presented as a Candidate's Thesis to the American Laryngological, Rhinological and Otological Society, Boston, Mass., June 5th, 1905.

which is generally predisposed to the development of scar-tissue. Other forms of fibroids also effect the lobule of the ear most often, yet there are a number of cases on record where the concha and even the meatus were the starting point.

Histologically, the tumor is composed of more or less cellular fibrous tissue. In a few cases on record, the character of the tissue was more embryonal so that the tumor would be more properly termed myxo-fibroma. The base is usually broad, but in the meatus pedunculated growths are occasionally encountered.

Case 1. Lipoma.

The diagnosis is generally easy, yet the harder forms may be mistaken for cartilaginous and even osseous growths. It should be remembered that while fibroid growths may assume a truly enormous size, their growth is generally very slow and painless. A fibro-sarcoma may present the same clinical picture, but the more rapid growth and the presence of more or

less pain will give a hint as to the malignant nature of the tumor.

Of much less clinical importance than fibroid tumors are those whose chief constituent is cartilage. Indeed, most cases described are not true chondromata, but auricular appendages or else mixed tumors of the parotid region which, among other tissues, also contain cartilage. True chondromata are, however, mentioned by Walliczek (Verhandl. d. deutsch. otol. Gesell. June, 1897), and by Pollitzer (Lehrb. d. Ohrenheilk).

Osseous growths on the other hand are very common and have been encountered in every form and in almost every part of the auditory apparatus. The following excellent classification is given by W. Kuemmel: (Handb. d. prakt. chir. Vol. 1).

(1) Ecchondrosis ossificans, similar to the exostoses at the epiphiseal junction of young children. These bony outgrowths are usually conical and are covered superficially with cartilage. They are seen most often in the auditory canal of children and may interfere very much with hearing.

(2) Exostosis eburnea and spongiosa. The former are usually rounded, the latter more conical, but exceptions are common. It is often stated that these growths take their origin from polypoid masses of granulation-like tissue, but in very many cases this supposed origin cannot be proven.

(3) Hyperostoses of the auditory canal usually involve the anterior and lower portions of the canal and give rise to considerable difficulty of hearing. They are manifestations of disturbance in the growth of the bone and sometimes occur as a result of long-continued suppuration. Their removal may be very difficult, owing to their position and their extreme hardness, so that special instruments have been recommended.

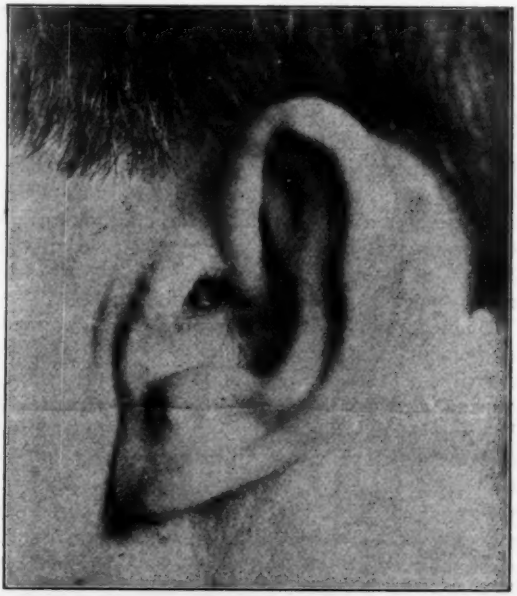
(4) Lastly, true osteomata are rarely found occupying the spaces of the mastoid process. They are analogous to similar structures in the ethmoid and frontal sinuses and their removal may occasion considerable difficulty.

In the middle ear bony growths are also encountered at rare intervals. In the three cases quoted by Buck (Diseases of the Ear, 1896, p. 166), suppurative disease had existed in two.

Fatty tumors belong to the rarest conditions found about the ear. The only cases found in the literature are those of Walliczek (auricle) (Verhandl. d. deutsch. otol. Gesellsch.,

January, 1896, p. 263), and of Ole Bull (auditory canal) (Zeitsch. f. Ohrenheilk. Vol. 32, p. 226).

The writer has observed the following case: John T., aged 29, had tumor (size of a bean) of upper external part of left lobule as long as he could remember. Also had a small tumor on the head and one on the right shoulder. Never experienced pain or discomfort of any kind. Examination: Circumscribed, lobulated, soft, fluctuating growth, slipping



Case 2. Papilloma.

away when the skin is picked up. Operation: Incision half an inch in length behind the lobule through skin and capsule. Tumor shelled out, skin flap brought in apposition and stitched. No recurrence after three years.

Microscopic findings: Connective tissue strands, forming very wide meshes which enclose typical fat cells. Tumor well circumscribed, capsule thick and firm, vascularization scant. No evidence of malignancy.

Pure myxomata have not been recorded. They are often reported as occurring in the tympanic cavity, but usually they are edematous polyps.

Angiomata are seen most often in children with similar growths in the neighboring parts. About the tragus they are generally plexiform, in other parts of the auricle, cavernous. The former often contain an abundance of young connective tissue and behave like malignant tumors. Cirsoid aneurysms occur by preference in the tissue between the lower jaw and the mastoid process. They generally start from the posterior auricular artery and spread over a considerable portion of the head, involving also the mucous membrane and the bone. The clinical importance of all these neoplasms is the great danger of hemorrhage. Sometimes the constant pulsation of the vessels gives rise to very disagreeable noises in the ear so that an extirpation is strongly indicated. Some cases have been reported cured after the injection of drugs which promote the coagulation of the blood, but in the majority of instances excision will be necessary. Severe bleeding may require ligation of the carotid.

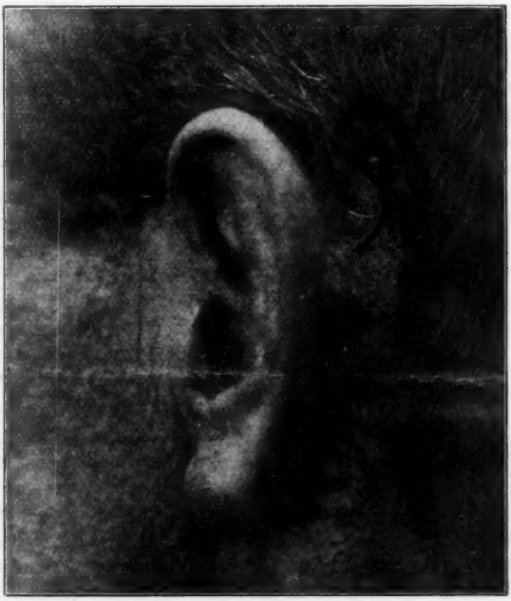
Intratympanal angiomata have been reported by Weir and Buck (Amer. Journal of Otology, Vol. 1).

True adenomata may start from the sebaceous glands of the external ear, and Jansen has recently operated a small intratympanal growth of this character (Verhandl. der deutsch. otol. Gesell. Jena, 7 Versam, p. 120). Strangely enough the glands which secrete the cerumen do not seem to give rise to tumors.

Simple papillomata are rather rare upon the auricle and appear generally as warts. Two interesting cases observed by Buck (Dis. of the Ear, 1898, p. 98) belong to this class. In both there was an anomalous development of the epidermis, giving rise to horn-like protuberances springing from the outer and posterior portion of the helix. The length of the tumor was three-fourths of an inch in one of the cases. Complete recovery followed removal. Frequently papillary granulomata are classified among this group, and the very first stages of carcinoma may pose as innocent warts. The following case of wart has been observed by the writer: James R. S., aged 22 years, noticed one year before a small pimple at the opening of the left external auditory meatus. This gradually increased until the patient entered the hospital. It was

very painful to the touch and bled when scratched. Examination: Small tumor, blocking the canal, covered with horny epithelium, that bled when touched with the probe. Tumor removed.

Microscopist's report: Typical papilloma, consisting of a thick epithelial layer thrown into folds, and a scanty vascular stroma, rich in firm connective tissue and elastic fibrils. The margin between epithelium and fibrous tissue is everywhere sharply demarcated.



Case 3. Sebaceous Cyst.

Granulomata, though not properly speaking tumors, may be conveniently discussed because they are at times closely connected with malignant growths. Two cases observed by the writer, pathologically reported granulomata, were later found to be respectively sarcomata and epitheliomata. They are very common in the tympanic cavity, as the result of irritants acting upon an inflamed mucous membrane, such as hair, nails, pieces

of necrotic bone, etc. Microscopically, we are here dealing with the ordinary vascular granulation tissue, generally covered by a rather thick layer of epidermis. They may attain a polypus shape and extend into the meatus, thus interfering with hearing. Since they prevent a free discharge of pus, they will aggravate the suppuration already present, hence their removal is earnestly indicated.

Much difference of opinion exists as to what constitutes a cyst. Pathologically a cyst is a tumor with fluid contents, whose inner surface is lined with epithelial cells. It is, therefore, not correct, in the strict pathological sense, if collections of serous or even sanguinolent fluid, without epithelial lining, be grouped here. There is a form of perichondritis serosa, which is more common in other bones, but is also met with upon the mastoid process and the cartilage of the auricle. There is no evidence of inflammation or of previous traumatism since the development seems to depend upon the effusion solely of serum into the bone or cartilage. True glandular cysts are certainly very rare. The following is an example of a sebaceous cyst observed by the writer: John J. T., aged 42. Twenty years ago was struck on side of head, the ear swelling very rapidly. In about a week the swelling subsided, and the ear assumed natural size. About a week later the lobule began to swell and slowly increased in size until it became the size of a cherry. For twenty years it remained stationary, never giving rise to pain or inconvenience of any kind. In the last months the patient was exposed a great deal to very cold weather. The tumor gradually became softer. Examination: A fluid mass that does not slip away from the skin when pressure is applied. There is but little resistance to the pressure of the fingers, showing the presence of fluid. Operation: Removal. No recurrence.

Microscopic findings: Unilocular cyst, the inner surface of which is lined by a single layer of cuboidal, epithelial cells. The contents are semi-solid and contain fat granules, cholesterin crystals, and cornified epithelial cells.

The hematoma auris seen in the insane is not properly a cystic tumor, for reasons stated above, yet it is often classed with this group.

A class of tumors closely allied to dermoid cysts and of the greatest interest in aural pathology, is termed cholesteatoma (the "Perlgeschwulst" of the Germans). Cruveilhier, Mueller

and Virchow (see v. Bergman, Handb. der prakt. chir. 1st edition, Vol. 1, p. 424), looked upon these tumors as heteropic epidermal growths while v. Troeltsch (Anl. f. Ohrenheilk, Vol. 4, p. 97) regarded them as accumulations of epidermis which have collected around a nucleus of cheesy pus. There can, however, be no doubt that tumors of the former type do occur. They may be found at autopsies without having given rise to any disturbance during life, as circumscribed rounded masses imbedded in the walls of the tympanic cavity. Their inner structure resembles that of an onion and has a distinctive mother-of-pearl gloss. Suppurative disease of the middle ear is generally present, but Lucae (Verhandl. d. berl. med. Gesell, Vol. 1, 1866), and Schwartze (Arch. f. Ohrenheilk, Vol. 41, p. 207), report cases where the tumor was the sole lesion. Clinically they present themselves as tumors of considerable size, which are generally soft and can easily be removed by blunt dissection. Smaller growths sometimes occur in the epitympanic recess and in the antrum and are generally discharged spontaneously through the external auditory meatus by means of the suppuration which they incite. These cholesteatomata should not be mistaken for the products of chronic desquamative otitis media. In the latter case masses of epidermis often form in the recess or in the antrum and soon become saturated with pus. They adhere very firmly and are removed only with difficulty, generally leaving the denuded bone rough. According to Miculicz (Bergman, Handb. d. prakt. chir., Vol. 1, p. 425), true cholesteatomata are a result of the inclusion of epidermal germs in the cavities of the temporal bone during the development of the ear. The differential diagnosis is of the greatest importance, since the treatment of tumor and otitis differs considerably. Most tumors within the tympanic cavity will require a radical operation, while desquamative otitis will generally be cured without an operation. Likewise, the prognosis is not the same, since cholesteatomata may cause very much destruction of bone and secondary meningitis, a complication which rarely occurs with desquamative otitis.

The writer has failed to find the following tumors mentioned in connection with diseases of the ear: lymphangioma, lymphoma, myoma and neuroma. The occurrence of true dermoid cyst is very doubtful; a few cases of atheroma of the auricle have been described (Gruber, Lehrb. Ohrenheilk, 2nd

Edition, p. 385), and Gillette reports an oil cyst. (Quoted in Bergman's Handb. d. prakt. chir., Vol. 1, p. 423.)

Malignant tumors may be classified in the following three groups: Carcinoma, sarcoma and endothelioma. All three are characterized by progressive growth, with destruction of normal tissue; a tendency to ulceration and recurrence unless operated upon in the earliest stages.

The most common of the three tumors enumerated is the form of carcinoma known as epithelioma, starting usually from the epithelial cells which cover the auricle.

The cause of epithelioma of the auricle is no better understood than that of epithelioma elsewhere in the body. It is essentially a disease of advanced age, and a history of trauma, frost-bite, etc., may frequently be obtained, without, however, settling the vexed question of etiology. On microscopic examination, the typical proliferation of the surface epithelium into the deeper tissue will be evident. Typical "pearls" may be seen and there is nothing which distinguishes these tumors from epitheliomata elsewhere. In the earlier stages, the tumors may appear as eczema or some other innocent skin lesion and there are few symptoms except perhaps slight pain, disfigurement and a moderate amount of discharge after the tumor has broken down. Later, with involvement of the temporal bone, the pains become more severe and are often located in the depth of the ear and may even simulate a trigeminal neuralgia. Necrotic portions of the bone are soon cast off with the purulent discharge and a pronounced fetor will develop. Soon the labyrinth will be affected and there will be facial paralysis, vertigo and deafness. The subsequent history of the case will depend to a great extent upon the direction in which the growth extends. There is often no distinct tumor, since the tendency to break down is very marked in these growths, so that nothing but a large ulcerating surface may be found. In the latter stages, the inferior maxilla may be involved so that there is pain on swallowing and obliquity of the jaw. Finally the growth will perforate the skull, involve the dura and even the brain tissue. Thrombosis of the lateral sinus is said to be somewhat more common. The internal carotid artery may be exposed by the growth, yet serious hemorrhages are infrequent, since the vessel is already obliterated. Cranial nerves may be implicated and the tumor may extend to the retronasal space or the atlanto-occipital

joint. Death is due to exhaustion, generally after one to three years. The surrounding lymph-nodes are not often involved and metastases on the whole are rare.

The frequency of the condition is given differently by different authors. Thus Connal has seen four cases in 15,000, Brueckner 1 in 3,000, and Habermann one case in 5,000 to 10,000. (Quoted from Lutz, Brooklyn Med. Jl. 1903.)

The diagnosis will present difficulties only in the earliest stages. An eczematous patch about the pinna, lobule or tragus that will not heal with the ordinary remedies, a nodule increasing in size, perhaps with pain or an irregular ulcer, with infiltration, which bleeds easily upon the slightest touch and exposes the cartilage upon its base, should always arouse suspicion. Usually these symptoms are found in patients over 40. T. P. Berens reported two cases before the Eastern Section of this Society, both of whom were under 40 years of age. In doubtful cases it is always well to excise a small piece from the periphery of the growth for microscopic examination.

Carcinoma of the external auditory meatus is very rare. Many of the earlier cases reported are not in reality malignant, for it is a well known fact in pathology that the microscopic appearance of certain benign tumors starting from the skin may closely simulate that of malignant growths. Many reports must thus be excluded despite careful pathological reports.

I have found the following cases in literature, which are undoubtedly instances of carcinoma starting from the external meatus; Jurka (Arch. f. Ohrenheilk, Vol. XXXIII), J. Orne Green (Arch. of otol., Vol. XXII), and R. Haug (Arch. f. Ohrenheilk, Vol. XXXVI). It is impossible to say how frequent the condition is since many cases are only seen after they have advanced so far that the starting point is no longer evident. The external meatus may also be involved secondarily; thus Buck (Dis. of the Ear, p. 414) reports one preceded by carcinoma of the middle ear, and another that originated in the glands of the neck behind and just below the ear. An attempt at removal is generally impossible, since the parts are too extensively involved.

Carcinoma of the middle ear is generally secondary to local eczema or to prolonged suppuration, which so alters the mucous membrane that a malignant disposition is acquired. These

cases are usually very severe since the disease is not recognized in the early stages. Suspicion should always be aroused if the discharge from the tympanic cavity becomes very abundant and foul smelling, and if polypoid masses, which bleed easily, constantly reform after thorough removal. Owing to the small space in which the tumor develops, the pain is generally very severe, and the neighboring parts, especially the facial nerve, are involved very early. There is nothing which offers resistance to carcinoma; even the mastoid process and the rest of the temporal bone are rapidly involved, and the discharge will soon contain bony sequestra. The glands are more rapidly involved than with epithelioma of the external ear, and metastases are on the whole more common.

According to P. Asch (Das Sarcom. des Ohres, Inaug. Dissert., Strasburg, 1896), sarcomata of the ear are somewhat more common than carcinomata. Other authors have seen the latter type of tumor more often. There is also a difference of opinion as to which part of the ear is most commonly involved. Kuemmel (Bergman's surgery, Vol. 1, p. 427) states that different parts of the auricle are affected often, but the meatus only rarely, while Lutz (Brooklyn Med. Jl., February, 1903) believes that the inner parts of the ear are the most common site. All the different histologic types have been encountered, but spindle-cell sarcoma and fibrosarcoma are most usual. Sometimes foci of ossification are seen. In the middle ear, round cell sarcomata are more common and even myxosarcomata are encountered. Kuhn (quoted from H. Langguth, Dissertation, Strasburg, 1896) believes that the presence of mastoid tissue here is due to the persistence of fetal structures which form the starting point of these tumors, but this has been recently denied by Eschweiler (Arch. f. Ohrenheilk, Vol. XIV., p. 18). The spindle-cell tumors often take their origin from the periosteum or the perichondrium; the round cell tumors from the submucous connective tissue. It is also possible that a comparatively large sarcoma of the ear is only a metastasis of a smaller, primary one; a case of this kind has been described by Kuhn (Verhandl. d. deutsch. otol. Gesell. Jena, 1895, p. 160), where the primary tumor was seated in the inguinal glands. Finally, multiple tumors may occur in different parts of the body, with involvement of the ear. Lymphosarcoma belongs to this type, and also a very peculiar growth, known as chloroma, charac-

terized by the presence of a green pigment (lipochrome), and a blood composition suggesting lymphatic leukemia. The rarest type of tumor occurring in the external or middle ear is the melanosarcoma, containing intracellular pigment. In the internal ear, some forms of gliosarcoma have also been described, originating from the facial or acoustic nerve.

The etiology of sarcoma is just as obscure as in the case of carcinoma. It is probable, however, that embryonal disturbances (the persistence of fetal structures) play a very important part.

The symptomatology of sarcoma of the ear is in the main the same as that of carcinoma. The diagnosis is often very difficult, and the symptoms very manifold with those tumors which start in the inner ear or soon spread to it. A fact to be remembered is that the patients need not be of advanced age; in fact, those sarcomata which could be traced to fetal inclusions were usually observed in early life.

Where the growth is plainly visible to the naked eye, it is generally fungous in character and bleeds very easily. Pain is usually an early symptom and often out of proportion to the size of the growth. The mastoid is involved early and fungous granulations will soon fill up the cells. In the middle ear and the meatus, the growths often appear as polypi, which are accompanied with an acrid, foul-smelling discharge and which reappear very rapidly when removed. It cannot be emphasized too strongly that all such polypi should be subjected to a microscopic examination, since many errors in diagnosis will thus be avoided.

Growths of the tympanic cavity are soon complicated by deafness, paralysis of the facial nerve, and enlargement of the glands of the neck; while with tumors of the inner ear there will be in addition, vertigo and paralysis of the different nerves at the base of the skull. (Abducens, trigeminus, vagus, glosso-pharyngeus and hypoglossus.) Later the growth extends into the brain and may give rise to hemiplegia. According to Hartman and Haug, sinus-thrombosis (see Bergman, Handb. d. prakt. chir., Vol. 1, p. 428), meningitis or brain-abscess do not occur, but secondary involvement of the temporal bone is not infrequent, Politzer (Lehrbuch d. Ohrenheilk), Haberman and others. (Arch. f. Ohrenheilk, 1897, p. 15.) Death usually occurs from cachexia, less often from hemorrhage, since even the larger vessels are thrombosed.

Sometimes the ulcerated surfaces permit the entrance of germs, and thus predispose to a sepsis.

The differential diagnosis between carcinoma and sarcoma has more theoretical than practical value, since the treatment for both conditions is the same. It is to be remembered, however, that the latter growth is more common in early life and that it forms larger tumors, while cancer is more prone to ulcerate. The prognosis is generally more hopeless in sarcoma than in carcinoma.

A few words are in place here concerning that peculiar tumor known as chloroma. An excellent article by Rosenblatt and W. Risel may be found in the Deutsch Arch. f. Klin. Med. Vol. 72, No. 1. The disease is usually symmetrical and accompanied by exophthalmos. The tumors affect the temporal bone more often than the immediate parts of the ear. If one of the swellings is incised a green pigment is discovered, the exact nature of which is not yet clear. Operation is not indicated since the growths are multiple and closely allied to lymphosarcoma and leukemia.

The distinction between endotheliomata and carcinoma or sarcoma is more of a pathologic than a clinical one, and no doubt many more cases would be on record if careful pathologic examinations would be made in every instance. Kuhn (Verhandl. d. deutsch. otol. Gesell. Jena, 1895, p. 160) speaks of two cases; in both, the auricle was the primary seat, but one was secondary to a similar tumor of the forehead. The tympanic cavity was primarily affected in the cases of Leutert (Verhandl. der deutsch. otol. Gesell. 1895, p. 160), Rasmussen and Schmiegelow (Zeitsch. f. Ohrenheilk, Vol. 15, p. 88). Many authors do not group endotheliomata among the malignant growths since their development is often slow and the cure complete and lasting after extirpation. They may, however, become malignant quite suddenly, hence should be treated as carcinoma. The prognosis is good, and of the cited cases only one was fatal after many years, owing to extension to the brain. The pathologic structure resembles that of sarcoma, but especially at the periphery the origin of the cell-strands can often be traced to the endothelial cells lining the lymph-channels. Lutz (Brooklyn Med. Jl., February, 1903) also includes angiomata among the malignant growths. They have already been discussed among the benign, yet it is true that the proliferation of vessels may sometimes erode

neighboring structures. In the truly malignant types, however, sarcomatous elements will generally be discovered on careful examination.

Syphilitic tumefactions hardly belong to a treatise on tumors of the ear, but are mentioned briefly since they may resemble true tumors. Gummata are of extreme rarity, yet when present they may be multiple (Baratoux), they form smooth red tumors with a peculiar elastic feel, the central portion will break down and discharge pus. An excavated ulcer with indurated edges will be the final result.

The cervical glands are enlarged more constantly, a syphilitic history may usually be obtained and other specific manifestations are quite common. Lupus vulgaris and leprosy attack the region of the ear.

Strawbridge (Trans. of the Amer. Otol. Soc., 1878) reports a case of lupus of the auricle, and Neumann (Monatssch f. Ohren., 1869) states that the auricle is the favorite seat of this disease. Of late, however, no cases are reported in this locality. Lupus may be symmetrical in development or unilateral. The favorite point of selection is the lobule, which soon becomes converted into a bluish, dependent tumor, soon agglutinating to the cheek. With the subsequent ulceration the auricle may disappear entirely, or else become converted into a shrunken mass. The meatus is very often occluded by the process.

In leprosy the lesions are rarely isolated, but may usually be found upon the rest of the face. All three varieties (tubercular, macular, and anesthetic) have been described affecting the ears. There is nothing distinctive of the lesions here.

128 West 59th St.

XLIX.

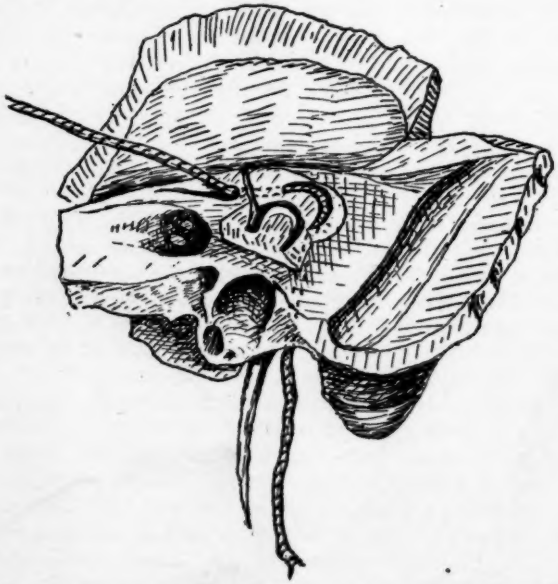
AN INTERESTING ANOMALY OF THE FACIAL CANAL.

A. J. Prentiss, M. D.,

Prof. of Anatomy, University of Iowa, and L. W. Dean, M. D., Prof. of Ophthalmology and Otology, University of Iowa.

Perhaps the anomaly depicted in the two sketches submitted may interest the aurists.

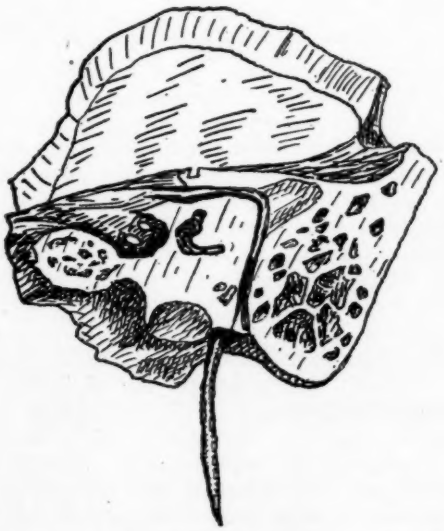
In Figure I a thread has been passed through the facial canal. It is observed that the entrance is in the posterior surface of the petrous portion of the temporal bone rather than in the internal auditory meatus.



The canal passes cortically dipping under the superior semicircular canal and in the same vertical plane turns, passing downward to terminate at the stylo-mastoid foramen. It,

therefore, has no relation whatever with the middle ear or antrum.

In Figure II is shown a vertical section through the facial canal. Three-eighths of an inch above the stylo-mastoid foramen is observed the opening of a small canal which takes the



usual course, passing above the foramen ovale and ending in the hiatus fallopii. Probably this is the passage of the large superficial petrosal nerve, the chorda tympani and the nerve to the stapedius muscle.

L.

A NEW METHOD OF TYMPANIC MASSAGE BY MEANS OF METALLIC MERCURY.

By Joseph C. Beck, M. D.

CHICAGO.

The usual methods of tympanic massage employed are: tragus; Siegel's otoscope; Delstanche's pump; the various pumps for pneumatic massage; by means of vibrators, as recommended by Zander; Lucae's probe; the various methods by the tympanic route, such as politzerization and catheterization; by means of the various tone-producing instruments, as recommended by Urbantchitsch, Marrage, and others; by means of tuning forks, as recommended by Hartmann and others. Weaver, of Chicago, recommended the use of a vibrator which is introduced into the Eustachian catheter, fitting the Eustachian tube.

In 1901, A. Foges, of the Gersuny's Clinic, of Vienna, published an article in the *Wiener medicinische Wochenschrift*, page 625, in which he described the use of metallic mercury in the treatment of adhesions of the uterus to the rectum, by allowing a quantity of from 500 to 1,000 grams of metallic mercury to rest in the posterior cul de sac in the Trendelnburg position, and reported a number of cases cured by this method.

After reading this article, it occurred to me that, if I could introduce a quantity of mercury into the middle ear and in that manner influence the adhesions of the tympanic membrane and ossicles, so as to loosen them, that procedure might give us some results in the large number of cases of adhesive inflammation of the middle ear. This procedure, however, being impracticable, or, rather, impossible, I inverted the experiment by allowing the mercury to flow into the external auditory canal and made the following observations: At first I constructed a simple apparatus for experimenting (Fig. 1) and that one I have continued to use all through, not having been able to improve upon it.

In order to prove the motility of the ossicles by this method, I made the following experiment. A patient who had a history of chronic catarrhal otitis media adhesiva died suddenly of cardiac trouble and the post-mortem was made to ascertain positively the cause of death. After the brain was removed, and, while the body was examined by the pathologist, I was given the privilege of using the head for my experiment. I chiseled off the tegmen tympani, in that manner laying bare the attic and ossicles. A thin wire was passed between the malleus and incus and another at the incudo-stapedial joint. Then thin strips of paper covered by a smoked surface, such as is used in sphygmographic tracings, were placed opposite these wires, which were bent slightly at the extremities. Now, with the apparatus fitting close into the external auditory meatus, and allowing two ounces of mercury by weight to fall against the tympanic membrane, we observed the movements of the ossicles by tracings. The apparatus consists of a glass

tube, about four inches long, three-quarters of an inch in diameter. The open end is drawn towards the point, the opening measuring from an eighth to a quarter of an inch in diameter. At this end we can either put a piece of rubber tubing, as in the Siegel otoscope, or the flange, as one finds on the Burnett otoscope.

The metallic mercury should be clean, preferably double distilled. We used two ounces by weight. A small cork is necessary to stop up the tube when not in use, as it is easy for the mercury to be spilled out. After using the mercury for a while the glass becomes covered with a dirty gray surface on the inside, which requires either that the mercury be changed or that the tube be wiped out with a cotton swab.

My experiments, which date from June 1, 1904, were carried out by my assistants, Drs. Goldberger and Hughes, under my direct supervision, and also by myself.

I selected for these experiments cases of chronic inflammation of the middle ear, wherever the two cardinal complaints

were present, namely, marked reduction in the hearing and very annoying tinnitus aurium. I preferred such cases as had been under treatment for a long time, without any marked benefit. I might say, in passing, that most of them had been under my treatment previously by the various methods, as inflation by catheter, use of bougies, pneumo-massage, general systemic and hygienic treatment; and wherever an obstructive lesion existed in the nose and wherever the throat presented an influence on the ears, these conditions were met with by the necessary local or surgical interference.

The therapeutic use of heat to the tympanic membrane has been recommended by many authors, the claim has been made that it does good in the class of conditions described above, and I have found by the aid of metallic mercury I can obtain any degree of heat I wish for a short period of time. Consequently I have been using it heated in the following manner: I have found that when the tube is held over an alcohol lamp until I count thirty slowly (40 seconds), the chemical thermometer introduced into the mercury at this time indicates a degree of heat 180° F. By moving the tube, shaking the mercury for four or five seconds, it will cool off to about 150° F., at which time it is allowed to flow in the ear and strike the tympanic membrane. The heating of the mercury evolves pure vapor of the same, which can be seen, as said before, as a dark coating on the glass, and I believe that mercury vapor in that state is easily absorbed by the tympanic membrane, particularly when it has been irritated by the compression of the mercury. I, therefore, claim that this method has a threefold therapeutic purpose, namely, (1) mechanical; (2) thermal; (3) chemical.

The technique of tympanic massage by this method is summarized as follows:

1. The ear should be thoroughly examined before this treatment is instituted for perforation, accumulations of cerumen, and long hairs about the meatus.

2. Remove cork and heat tube over the alcohol flame, as indicated.

3. Incline the patient's head to the side to be treated, and fit tube tightly into the external auditory canal, like a Siegel otoscope.

4. Slowly (particularly if it is the first treatment) allow the mercury to flow into the canal, leaning the patient's head to the opposite side.

5. Supporting the patient's head with the right or left hand, and holding the tube tightly in the canal, pulling the auricle over the tube in such a manner as to straighten the canal, and moving the head from one side to the other, laterally, at a faster and faster gait. In that manner will the mercury strike the tympanic membrane with sufficient force.

6. If both ears are affected, two tubes are introduced simultaneously, and both tympanic membranes are massaged at the same time.

7. Delstanche's pump or Siegel's otoscope as well as inflation follow this treatment.

8. The number of excursions to be made are governed by experience, but it is well to start with five and increase to twenty-five at the next treatment. Usually, after about six weeks to two months, I discontinue the treatment and, after the same lapse of time, start up again for the same period.

9. After each sitting one should look into the external auditory canal for retention of particles of mercury, and when such are present they can, as a rule, easily be dislodged by shaking the head and moving the auricle. Should they remain, they will cause no untoward symptoms, or complications.

Some interesting observations that I have made while using this method of treatment: A patient who had a small perforation of the tympanic membrane in the lower half was treated by one of my assistants by this method, who noticed shortly after that the patient became very dizzy, and this continued for two days. By the use of the Siegel otoscope I was able to discover in the upper margin of the perforation a small globule of mercury, and after dislodgement of the same the patient was entirely free from dizziness.

Another patient who had a very large perforation, and a very patent Eustachian tube, so that whenever his ear was irrigated water would flow freely through into the pharynx, was treated for experimental purposes by allowing a quantity of mercury to flow into his auditory canal, and small particles of the same would pass into the pharynx.

A patient who had a severe earache was entirely relieved by allowing a small quantity of hot mercury to flow into his ear, and remain for a minute or two.

Another patient, who had a large mass of inspissated cerumen, which resisted the usual method of removal by washing, was treated by permitting a quantity of hot mercury to flow

into his ear and remain for a few moments. Again the douche was resorted to and the mass came out very readily.

In conclusion, I wish to say that I have not achieved any wonderful results by this treatment, nor do I consider it a panacea for all ills, but simply as an experiment of some practical value. I have tabulated the cases which are in themselves not at all interesting, numbering about 250 cases. Improvement of tinnitus aurium followed in most of the cases, except where a general constitutional disease was the cause of this symptom, namely, arterio-vascular changes.

So far as the hearing is concerned, the cases that heard a low scale of the tuning fork were much improved, and in those that showed any involvement of the labyrinth, the improvement was comparatively *nil,* or purely suggestive.

Since I first presented this subject in St. Louis, last February, at the Western Section of the American Otological, Laryngological and Rhinological Society, several gentlemen who have been using this method have found practically the same results as I have. I have never found a case that could not tolerate the treatment, nor one that claimed he was worse after using it.

There is one case of an ear specialist who has been treating himself by this method. I wish to describe the details and the results obtained. Dr. A. T., 39 years old, had double suppurative ear disease when a boy; both ears healed up with treatment followed by a marked cicatricial condition of the tympanic membrane. The main symptom was marked tinnitus aurium, not influenced by inflation, massage, internal medications of bromids, hyoscin, pilocarpin, etc.; this was moderately benefited by the use of this method of treatment (metallic mercury).

I discourage the use of this method on the part of the patient himself as home treatment, nor would I use it indiscriminately without first examining the ear for perforations, etc.

92 State Street.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I—EAR.

Experimental Studies in Regard to the Action of Fowler's Solution of Arsenic on the Ear.

ALBERT BLAU (*Archiv. für Ohrenheilkunde,* July 31, 1905). Arsenic and its compounds produce clinically and experimentally demonstrable actions in a number of different organs. According to Lewin the following division may be made:

On the skin: dermatitis, urticaria, erythema, acne, and herpes zoster.

In the intestinal canal: burning sensations in the mouth and throat with a feeling of dryness and irritation, stomatitis, nausea, vomiting, etc.

In the kidneys: polyuria, albuminuria, and hematuria.

In the upper respiratory passages: coryza, epistaxis, laryngitis, and bronchitis.

In the central nervous system: dizziness, headache, motor disturbances, and paralyses. Pathologically, with other changes such as ulcers, etc., hemorrhages have been found and, according to Henscher, myelitis. On the part of the ear, according to Rossbach and Nothnagel, ulceration in the external canal is occasionally seen in cases of chronic arsenical poisoning.

Haug believes that changes may occur in the middle ear with deafness, and with or without subjective noises.

The author's experiments were made as follows:

1. Six white mice were inoculated with 1-3 of a Pravaz syringe full of Fowler's solution. After ½ or ¾ of an hour, mild convulsions developed and symptoms of paralysis, at first in the fore, and then in the hind feet. As soon as the first symptoms of respiratory paralysis appeared, the animals were killed.

2. Three guinea pigs were poisoned with increasing doses of Fowler's solution during several days, i. e., November 4, each 1-3 Pravaz syringe full; on the 6th, the same amount; on the 8th, ½ syringe full, and on the 10th, ¾ syringe full. Two hours after the last injection, the pigs showed the same symptoms as the mice. They were also killed shortly before death by dividing the great vessels in the neck.

Four mice and three guinea pigs were then so treated that the entire head was immersed in Formalin-Müller's solution, for twelve or twenty-four hours. Then the entire ears of the mice, and the labyrinths of the pigs, were placed first in the same solution, then hardened in alcohol and imbedded in celloidin.

The results of the experiments proved that the specific action of arsenic on the ear must be regarded as not producing hemorrhages. Its action is purely toxic. No hemorrhages were found in the labyrinth; on section of the animals, small petechiae were found in the pericardium and on the pleura.

The author, however, was enabled to determine definite changes in the ganglion cells of the ganglion spirals as well as the ganglion scarpae. They consist of changes which involve the protoplasm. In the mice, which had all been treated with single doses, changes were found in the ganglion scarpae and ganglion spirale, as well as in the ganglion cells of the cerebellum. Several cells were found in which the entire protoplasm had taken on a diffuse, dirty color. In the guinea pigs, which had been treated with four doses, with long intervals between each, the greatest changes were found. The majority of the ganglion cells were found destroyed.

In conclusion, the author states, that arsenic certainly produces distinct changes in the nervous labyrinth parts. Because of the absence of other changes in the labyrinth, we must conclude that the rarely observed clinical disturbances, such as subjective noises and slight deafness, are caused by the above described changes.

Inflammatory changes undoubtedly belong to the cases of chronic arsenical poisoning, as also appeared to be proved by the author's findings in the ganglion spirale. *Theisen.*

Some Considerations Regarding Ligature of the Internal Jugular Vein on Account of Ear Disease.

DUNDAS GRANT (*Journal of Laryngology,* September, 1905). The value of ligation of the jugular is questioned. Collateral circulation always exists. Suction into the veins of the head after such ligation has been observed. Stasis is in any case favored, leading to the formation of thromboses and even of cerebellar abscesses. Even in the case of healthy veins, such ligation has occasionally been followed by fatal results, edema of the brain occurring as the result of a narrow jugular on the opposite side. Where there is a clot in the

jugular bulb, Grant recommends, after removing all disease from the mastoid cells, turning out the broken-down clot from the lateral sinus with a margin of healthy clot on either side. Where we have a breaking down of the clot, or pyemic symptoms assert themselves, the vein is to be tied as high up as possible above the facial vein's origin. The ideal place, entirely impossible, would be where the inferior petrosal empties. In no case is ligation to be practiced apart from proper surgical attention to the lateral sinus.

Pathologic Changes in the Labyrinth Found in Chronic Suppuration of the Middle Ear.

POLITZER (*Archiv. für Ohren.* Vol. 65, p. 161).

A report of a series of ten radical operations, which resulted fatally, where the inner ear was studied by means of serial sections. All the cases had been tested functionally before the operation.

This series represents a portion of the 8-9% of fatal cases in Politzer's clinic following the radical operation. Changes of all degrees were found, including the presence of pus and the loss of bone to a greater or less extent. This was most marked in the promontory wall where the bone was seen bored into, pierced with holes or eaten away. The diagnosis is difficult or impossible in many cases where there has not been actual exfoliation of the cochlea. The so-called labyrinthine symptoms of vertigo, nystagmus and vomiting can be lacking, and, even when present, must be regarded as only an aid in diagnosis, as they can occur in irritation of the meninges or brain as well as in certain middle ear affections with intact labyrinth. In the ten cases, vertigo and nystagmus were noted only once. This is to be explained by the preservation in part of the auditory nerve. Adler's symptom was confirmed, i. e., vertigo vomiting, also at times the pulse rate was relieved when the patient was placed on the diseased side in labyrinthine disease, and on the sound side in cerebellar abscess. Of still greater value in diagnosis are the tuning fork tests—Weber's (even though exceptions exist) and especially Schwabach's (reduction of bone conductions in labyrinthine disease). Politzer believes much can be done surgically for these cases. Where the indications exist, the surgeon is justified in freely opening the labyrinth to secure drainage.

Harris.

Primary Jugular Bulb Thrombosis in Children as a Complication of Acute Purulent Otitis Media with a Report of Cases.

McKernon (*New York Medical Journal,* July 1 and 8, 1905). Five cases are reported in detail, all terminating successfully after operations on the sinus. McKernon believes the infection takes place through the floor of the tympanic cavity. The diagnosis is based on excessively high temperature with great remissions occurring in connection with an acute purulent otitis. Weight is also attached to polynuclear percentage, which, if between 80 and 90, is indicative of a profound infection. The jugular was not tied in any case. The author regards time as an important factor in operating and feels that a jugular ligation would have prolonged the operation to a fatal result. *Harris.*

Symptomatology in Acute Otitis in Children.

Kerley (*New York Medical Journal,* July 8, 1905). In 72 cases seen by Kerley fever was the one striking symptom. Pain was absent in 50 cases, or 69%. *Harris.*

II—NOSE AND ACCESSORY CAVITIES.

Experimental Irrigations of the Maxillary Antrum.

K. M. Menzel (*Archiv. für Laryngologie und Rhinologie, Bd. XVII, Heft III,* 1905). Investigations were made for the purpose of determining whether it was possible to infect the frontal sinus in cases of empyema of the maxillary antrum, by irrigations of the antrum. Menzel was induced to try these experiments by a statement made by Lermoyez, that in irrigations of the antrum of Highmore, in which the irrigating fluid was injected with more or less force, some of the pus could be carried into the frontal sinus by way of the hiatus semilunaris.

Lermoyez has reported two cases in which affections of the frontal sinus developed during the treatment of an empyema of the maxillary antrum, and two similar cases are reported by the writer. The results of his experiments made on cadavers are briefly as follows: the irrigating fluid injected through an opening into the antrum of Highmore only reached the frontal sinus where an external opening had also been made into the sinus. In all the trials made, in which no external

opening was made into the frontal sinus, there was not a single instance in which any of the irrigating fluid even when forcibly injected into the antrum, reached the frontal sinus. In the majority of the cases not even any fluid penetrated to the anterior ethmoid labyrinth.

In conclusion, the author states, that a direct infection of the frontal sinus in the way described by Lermoyez cannot take place, even in very forcible irrigations of the antrum of Highmore, because the sinus being filled with air, will not allow the entrance of any of the irrigating fluid. *Theisen.*

The Histology and Origin of the So-called Bleeding Polyp of the Septum.

EMIL GLAS (*Archiv. für Laryngologie und Rhinologie, Bd. XVII, Heft* 1) reviews the literature and gives the result of his own investigations.

(1) The so-called bleeding polyps of the septum are new formations of inflammatory origin, which are produced in the presence of certain conditions of the mucous membrane (*rhinitis sicca anterior* with atrophy of the glands). Proof of the inflammatory origin is afforded by the histological picture (granulation tissue, intra-epithelial foci of leucocytes, coagulation, necrosis of the uppermost layers, numerous plasma cells).

(2) The histologic structure of the bleeding polyps of the septum is an exceedingly various one, nevertheless the chief constituents of these growths are granulation tissue, and new formed vessels and sinuses. According to the relative proportion of these elements, these growths are called granulomata or angiomatous tumors.

(3) Bleeding polyps of the septum are genetically related to *rhinitis sicca anterior* (as is also the perforating ulcer of the septum). Proof of this is afforded by the histologic findings, since we see reproduced in these tumors all of the histological peculiarities characteristic of *rhinitis sicca anterior* (a substance resembling keratohyalin penetrating into the deeper cell layers, pigment of hematogenous origin, numerous epithelial connective tissue or the formation of a sub-epithelial plasma cells, much hyalin cell degeneration and horny changes in the upper cell layers).

(4) Bleeding polyps of the septum are dependent chiefly on a basis of atrophic mucous membrane, which is characterized especially by two peculiarities, namely, atrophy of the sub-epithelial connective tissue, or the formation of a sub-epithelial hemorrhagic zone, with atrophy of the glands, which should normally occur in large numbers, at the point of localization of these tumors.

(5) The vulnerability of these tumors is explained by the following factors: first by the intimate deposit of keratohyalin-like layers in the epithelium, second by the atrophy of the sub-hemorrhagic zone, third by the disproportion between the elastic tissue and the vascular tissue, fourth by the coagulation-necrosis occurring in the upper layers.

(6) The question why *rhinitis sicca anterior* develops at times into bleeding polyp of the septum, and at times into perforating ulcer of the septum is answered by the writer as follows: while in the case of perforating ulcer the tissue is penetrated by micro-organisms, in bleeding polyp of the septum, on the other hand, these are found only in the uppermost layers of necrosed portions. In the first instance, progressive necrosis arises by bacterial invasion, in the second the irritation gives rise to inflammatory new growths. An important role appears to be played here by the behavior of the glands. If the atrophic process has attacked the glandular layer, an important agent favoring bacterial invasion is lost, and there is a development not of retrogade changes, but the formation of granulations, which give rise to bleeding polyp. If, however, the atrophic process of the anterior septal mucous membrane is not far advanced, and if especially the glands with their broad channels of exit are present, then in predisposed individuals, a progressive necrosis develops which ends with perforation of the cartilaginous septum.

Goodale.

Leptomeningitis Following Killian's Operation on the Frontal Sinus.

MERMOD (*Archiv. Internat. de Laryngologie,* July-August, 1905). The case was that of a man of 59, who had had sinus suppuration for many years, with several operations on the maxillary and sphenoidal sinuses. In the course of the Killian's, the intersinus septum was slightly opened. The right sinus, the seat of the disease, showed intact walls and was

full of pus and granulations. The ethmoid cells were cleaned out, but the sphenoid were not touched. The evening of the second day symptoms suggesting apoplexy showed themselves, although there were no paralyses. Death occurred on the fourth day. The autopsy showed a general lepto-meningitis of the convexity and base, *except on a level* with the *anterior ethmoid-frontal region.* Here on both sides, the roof of the orbit, cribriform plate, the dura which covered them—also the pia—showed not the slightest sign of infection. This showed itself first 1 cm. posterior to the sella turcica. The field of operation looked healthy in every particular. In the mass of the second convolution of the right temporal lobe about 2 cm. behind the anterior pale, a hemorrhagic area was found filled by a black clot. Microscopic sections of the walls of the sphenoidal sinus, the cavernous sinus and its nerves, the wall of the frontal sinus and the roof of the orbit did not reveal anything of pathologic interest.

The author, without being able to point out any error in operative technique, nor a sufficient explanation for the meningitis, feels it must be in some way due to the operation.

The Adenopathies in the Affections of the Nose and Rhinopharynx.

GELLE (*Archiv. Internation. de Laryngologie,* July, August, 1905). A valuable contribution to this important subject, deserving to be read in full, is the work of Most in 1901 and Cuneo and André in 1905. They have completely revised our views on the anatomy of the lymphatic system. They have shown that the lymphatics of the nose lie in the layer immediately beneath the epithelium. The system is a rich one especially in children, where the mucosa is thickest. This is particularly the case at the free borders of the turbinals. Contrary to the former theory, the vessels, while varying much in size and form, have walls completely closed. Two systems are recognizable, one corresponding to the respiratory and one to the olfactory area. They are quite independent of each other. The vessels of the two nostrils communicate freely with each other, with the lymphatics of the outside of the nose and the face and posteriorly with those of the pharynx and larynx. Finally, the lymphatics of the olfactory zone, representing the upper third of the septum and nasal walls, are easily injected by the meningeal route. These facts suggest

an explanation for the cases of meningitis which have followed cauterization of the middle turbinated, as well as the glandular involvements of face and neck following nasal infection. An abundant series of afferent and efferent ducts exist for the collection of the lymph and its proper transportation. One reservoir is situated close to the mouth of the Eustachian tube, explaining the infection of the tube and ear following a similar infection in the nose.

The glands outside the nose, but in direct communication, are numerous. Three layers exist in the parotid gland—superficial, deep and those situated between the gland and the wall of the pharynx. Besides these must be mentioned the submaxillary, 5-6 in number, the retro or lateral pharyngeal, two in number in the infant, but atrophied in the adult, and the glands of the internal jugular region.

The lymphatics of the accessory sinuses have not been fully studied, but it is generally believed that they have direct or indirect communication through their bony walls with the lymphatics of the cranial cavity. This question of naso-meningeal communication is, however, still to be settled. The second part of the paper is devoted to the clinical side of the subject. Attention is directed to the necessity of determining, in the case of a given adenopathy, its lymphatic connections and supply. The intensity of the gland infection need not at all correspond to the degree of local disease. Adenitis can develop from a simple acute rhinitis. The streptococcus pyogenes is usually accountable, with or without staphylococci associated. The solution in the continuity of the mucosa can be recognized in certain instances; at other times nothing is to be seen. Occasionally in furuncles of the alae, or in impetigo, we will note submaxillary adenitis. In connection with this, a purulent rhinitis and keratitis interstitialis is often favored. Such glandular inflammation will occur, also, following surgical work on the nose or throat. While adenitis rarely follows a simple acute rhinitis, it is common to see it following an attack of acute inflammation of the nasopharyngeal lymphatic growths.

Erysipelas of the nasal mucosa as a primary affection is met with not rarely. It is characterized by fever, chills, frontal headache, frequent epistaxis, dryness of the nose, mucopurulent secretion, crusts and external congestion of the mucosa. Here a stiffness of the neck, with pain, due to an adenopathy of the neck is of diagnostic importance.

Nasal Diphtheria, primary in nature, is associated invariably with an unilateral adenopathy, which can be recognized as one or two glands, at the angle of the jaw, rolling under the fingers. In an ordinary rhinitis, this is absent, or, if present, is bilateral.

The *retro-pharyngeal* abscesses can develop in the course of a rhinitis, or pharyngitis, however slight.

Ganglionic fever is especially dwelt on as an affection of the glands in early childhood, of nasal origin. A healthy infant is seized, often suddenly, with fever, loss of appetite, and obstinate constipation. No organic disease discoverable. A few days later, difficulty in moving the head is detected, and in the neck a glandular swelling, which is unilateral and situated at the angle of the jaw, as a rule. The gland is hard to the touch, painful and varies greatly in size. The adenopathy continues for several days and then gradually subsides, usually without suppuration.

Glandular swellings can occasionally develop in the course of an acute sinusitis. Finally attention is directed to the adenopathy in the course of syphilis and tuberculosis of the nose, including primary lupus. The author closes with the interesting observation that primary, malignant disease of the nose, whether sarcoma or epithelioma, is, as a rule, not associated with any adenopathy, especially in the early stages.

Harris.

Nasal Obstruction and Nutrition.

FRIEDENBURG (*New York Medical Journal,* April 22, 1905). The effect of faulty nasal respiration upon digestion and nutrition is too often overlooked. It may be the sole cause in the infant where, in consequence of mouth breathing, much air is swallowed with the milk. While, in the older child, it serves to produce "bolting the food whole." The author lays much stress, after operation, upon careful training in restoring proper nasal respiration, and advises for this gum chewing, gymnastics, singing, speaking, and, at times, chin bandages. *Harris.*

III—PHARYNX.

Pharyngitis Sicca and Chlorination.

CHAUVEAU (*Archives Internat. de Laryngologie,* July-August, 1905). An attempt to assist in the knowledge of the pathology by report of a case. A man of 62, clerk, presented himself for intense dryness in

mouth and throat, and complained of a band around neck, which disturbed deglutition. The diminutive quantity of saliva was very acid. Teeth all right. Examination of pharynx did not show any disease, granulations, or varicosities. The mucosa had a sombre color. It was dry, of a varnished appearance. Reflexes of palate and pharynx abolished; examination of urine showed no sugar or albumin. No organic trouble. All medication and treatment was without avail till a quantitative test of the urine was made, which showed the proportion of chlorates decidedly below normal. It was impossible to account for this till it was learned that on account of a previous eczema, the patient ate no salt. A hyperchlorate diet was at once ordered, with the most remarkable result. In three weeks the pharyngeal mucosa became rosy in color, much more humid and the saliva reappeared. Taste came back. In a word, all symptoms disappeared.

Harris.

IV—LARYNX.

Two Cases of Primary Erysipelas of the Larynx.

L. BLUM (*Deutsche medicinische Wochenschrift*, September 7, 1905) reports the two following cases in which a facial erysipelas followed the laryngeal affection, so that there was no question as to the diagnosis of the laryngeal condition:

Case I. Pregnant woman, aged 35 years, complained of much pain in swallowing and difficulty in breathing. Patient's face was cyanotic and an inspiratory stridor was present.

The pharynx was somewhat reddened and was free from membrane. A few, small, light yellow blebs were present on the mucous membrane of the hard and soft palate. The uvula was not edematous, and was freely movable. Patient could not open the mouth well on account of severe pain in the right maxillary articulation. Glands in the neck were enlarged and tender to the touch. The right side of the neck was also swollen. Voice was aphonic. A laryngeal examination could not be made, but on examination with the finger, the epiglottis was found very much thickened, but there was no fluctuation. Patient was given 4,000 units antitoxin and cold applications were applied to the neck.

Two days later, a facial erysipelas developed, starting in the ears and extending over the face. Breathing was now much improved. The spleen was enlarged. A laryngeal examina-

tion could now be made, and the epiglottis was found to be still reddened and swollen. Vocal cords slightly reddened. A purulent otitis media of the right ear, and a left otitis externa, developed. The further history of the case is of no great interest.

Case II. Girl, aged 18 years, had been hoarse for two weeks with bloody expectoration. Dyspnea marked. Pharynx not reddened. Sputum was decidedly pneumonic and contained many pneumococci, but no tubercle bacilli. The Gruber-Widal test was negative. Leucocytes 9,000. On laryngeal examination, the epiglottis and laryngeal mucosa were found reddened. Four days later, the pharynx became involved, the mucous membrane of the entire mouth being very red. There was a yellow deposit on both tonsils which were much swollen. The spleen was enlarged. Throat cultures showed no diphtheria bacilli but many streptococci. A week later, a facial erysipelas developed, starting in the right nostril and extending over the face. The throat symptoms were much improved while the process was extending over the face. In conclusion, the author states, that the diagnosis of primary laryngeal erysipelas often presents difficulties, particularly as the condition is so uncommon.

Theisen.

A Contribution to the Origin of Cysts of the Epiglottis.

KAHLER (*Archiv. für Laryngologie und Rhinologie, Bd. XVII, Heft* 1) divides cysts of the epiglottis into two classes dependent upon their etiology. In the first group we find retention cysts, comprising the greater number of these tumors. This group probably includes also those which have been described in catarrhal affections, as translucent glassy cysts with mucous contents. In the second group we find the embryonal cysts, the origin of which may be explained in two ways. On the one hand, they may be considered of entodermal origin, and on the other hand, they may be considered as arising from the branchogenic system, especially if we bear in mind Gegenbauer's view of the origin of the epiglottis from the fourth branchial cleft. The thyro-glossal duct or the embryonal thyroid tissue has nothing to do with the origin of epiglottic cysts.

Goodale.

Unilateral Affections of the Vocal Cords.

A. ROSENBERG (*Archiv. Internat. de Laryngologie,* July-August, 1905). A report of three cases where only one cord was involved and yet the favorable termination showed the condition was entirely a benign one. The appearance was that of intense redness—sometimes vivid, sometimes sombre, thickening and difficulty in movement. Such a clinical picture is usually suggestive of a specific trouble.

In tuberculosis, Rosenberg states that the redness is less pronounced, the contour less altered, ulceration is often present. From syphilis it is distinguished by the sombre redness and the regularity of thickening, in addition to the general stigmata of syphilis.

Carcinoma is to be recognized by the gradual increase of the redness, which in catarrhal laryngitis is only of moderate intensity. At first only a small segment of the cord is involved; also restricted movement is not so noticeable. *Harris.*

V—MISCELLANEOUS.

Chlorid of Ethyl Anesthesia in Laryngologic and Otologic Practice.

NEUENBORN (*Archiv. für Laryngologie und Rhinologie, Bd. XVII, Heft* 1) agrees with the results found by Chaldekott (*British Journal Children's Diseases,* February, 1904) in his work on ethyl chlorid in comparison with other narcotics.

(a) Advantage over laughing-gas. The narcosis is quieter, and without symptoms of suffocation, opisthotonus and jactation. There is no elaborate apparatus necessary, the anesthesia lasts twice as long.

(b) It has the following advantages over ether. It is pleasanter; complete anesthesia is attained much more rapidly and without excitement; there is no excessive secretion of mucus; it leaves behind no unpleasant taste and smell; the after-effects are, in general, much slighter.

(c) It excels chloroform in the following particulars: It can be given in any position of the patient; anesthesia is adduced much more rapidly and comes without excitement; it can be given in definite amounts; it is much safer; the after-effects are slight or absent.

To this should be added that ethyl chlorid has many advantages over ethyl bromid; it is much pleasanter; there is no stage of excitement; there are no unpleasant phenomena

such as apnea and convulsions; the after-effects are much slighter; patients do not fear narcosis subsequently so much as with bromid ethyl; erotic manifestations are absent or come only occasionally. *Goodale.*

The Histologic Relation of Paraffin to Living Tissues in Man.

ESCHWEILER (*Archiv. für Laryngologie und Rhinologie, Bd. XVII, Heft* 1). As the result of histologic investigations, the writer concludes that the fate of injected paraffin is a complete disappearance, and replacement by connective tissue. This requires a long time, since in the case examined marked phenomena of reaction and absorption were found at the end of a year. It is not yet decided whether the disappearance of the paraffin is by solution in the fluid of the body or through fine subdivision. *Goodale.*

The Surgical Treatment of Facial Paralysis.

FURET (*Revue Hebdomadaire de Laryngologie,* August 12, 1905). Ballance, in 1895, was the first to practice the anastomosing of the facial and the spinal accessory nerves for this affection, but Furet, in 1898, was the first who described the operation when he performed it in connection with Faure. Since then it has been done twenty-five times in all—eighteen times the spinal accessory was chosen and eight times the hypoglossal nerve. As a whole, the results have been satisfactory. In only six cases was there no improvement. This improvement consisted, in the largest degree, in increased tonicity of the muscle and so in decrease of the facial deformity. This applies only to the period of repose. When the muscles are in activity, the asymetry returns. When the spinal accessory is the nerve which is anastomosed, this occurs also during movements of the arm and shoulder of the corresponding side. Education, however, will, in a measure, serve to overcome this. On this account, Furet advises choosing the hypoglossal in preference. The lingual hemiatrophy which follows is not permanent, nor even constant. The increased difficulty of the operation is only apparent. Often the hypoglossal trunk is larger than that of the spinal accessory. An additional argument in favor of this choice is the close proximity of the centers of the facial and hypoglossal.

Improvement after the operation begins about the sixth month. *Harris.*

New Histologic Investigations Upon the Final State of Paraffin Injected into the Human Tissues.

BROECKAERT (*Revue Hebdomadaire de Laryngologie,* August 19, 1905). After a careful study of the question, the author arrives at his former conclusion, that solid paraffin is encysted in the tissue and is not absorbed. Upon its introduction a reaction more or less violent is produced. Leucocytes try to penetrate into it. Infiltration is, however, exceptional. A sort of phagocytosis occurs, which gradually subsides. When the soft paraffin is used, the reaction is greater. Here may be produced, around the separate drops, a condition suggesting a tumor, or, as it may be called, a paraffinoma. *Harris.*

Laryngopharyngeal Polypi.

BOTEY (*Revue Hebdomadaire de Laryngologie,* August 26, 1905). Botey describes a rare form of neoplasm, of which he has observed several cases, which springs from the anterior wall of the phanyngoesophageal wall. In structure, they are simple polypoid cysts, produced by retention of their mucous contents. Because of their peculiar situation, they in time develop a long pedicle, in one of the cases reported, sufficiently long to permit the tumor to protrude from the mouth during vomiting. At times they produce symptoms of intense dyspnea. Dysphagia, nausea and vomiting are frequent. Usually, because of their situation, they cannot be seen with the laryngoscopic mirror. Removal is easy by means of forceps and scissors during vomiting. Hemorrhage is not to be feared.
Harris.